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A Summary of Current Program, 9/1/63  
and Preliminary Report of Progress  
for 9/1/62 to 9/1/63

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FARM PRODUCTION ECONOMICS DIVISION  
of the  
ECONOMIC RESEARCH SERVICE  
UNITED STATES DEPARTMENT OF AGRICULTURE

This progress report of U.S.D.A. and cooperative research is primarily a tool for use of scientists and administrators in program coordination, development and evaluation; and for use of advisory committees in program review and development of recommendations for future research programs.

The summaries of progress on U.S.D.A. and cooperative research include some tentative results that have not been tested sufficiently to justify general release. Such findings, when adequately confirmed will be released promptly through established channels. Because of this, the report is not intended for publication and should not be referred to in literature citations. Copies are distributed only to members of Department staff, advisory committee members and others having a special interest in the development of public agricultural research programs.

This report also includes a list of publications reporting results of U.S.D.A. and cooperative research issued between September 1, 1962, and September 1, 1963. Current research findings are also published in the ERS publications The Farm Index, a monthly, and Agricultural Economics Research, a quarterly. This progress report was compiled in the Farm Economics Division, Economic Research Service, U. S. Department of Agriculture, Washington, D. C. 20250

UNITED STATES DEPARTMENT OF AGRICULTURE  
Washington, D. C.  
September 1, 1963



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## INTRODUCTION

Farm production economics research, as used in this report, deals with many and varied economic problems of agricultural production. The work is concerned with the economics of organization and management of farms, use of capital and labor in agriculture, production and conservation practices, adjustments in production and resource use, farm financial problems of credit, insurance, and taxation, and appraisal of alternative production policies and programs.

Rapid technological change in agriculture and the tendency for farm production to outstrip growing demands for products gives rise to continued need for economic adjustments in our farm economy. Farms are decreasing in number and increasing in size and degree of specialization. Farm machinery, fertilizers, and other innovations, are substituting for land and labor. Coupled with rising farmland values, these developments necessitate large and increasing capital investments per farm, and alter farm credit and insurance needs. The great changes occurring in rural communities--some pressed by rapid urban and industrial expansion, for example; others faced with sharply declining populations--are arousing increasing concern in rural people over local government and taxation. These trends challenge the most rigorous research in the field of farm economics. Results of research in this field are widely used as aids in management and policy decisions at the farm, area, regional, State, and national levels.

The Department's program of research and related statistical reporting in farm production economics is conducted from headquarters in Washington, D. C., and is concerned chiefly with problems of regional and national scope. Field studies generally are conducted in cooperation with State experiment stations. When studies are made jointly by Federal and State workers, Federal people usually are most interested in regional and national applications of results, while State workers are most often interested in local applications. Close working relationships between Federal and State agencies have long been traditional in this field. This close cooperation in planning and conducting the work reflects joint and cooperative efforts rather than overlapping or duplication of effort.

The farm production economics research program is covered under 10 area headings shown in the Table of Contents. More detailed subject-matter subheadings are given in the discussion of each area of work.

In the 12 months since progress was last reported to research advisory committees, the special policy and program contributions that the Division



has been able to make have been significant. Division personnel have responded to many requests for assistance from the Office of the Secretary, program administrators, the National Agricultural Advisory Commission, and others. In addition, many of the Division's continuing statistical series and analyses have become increasingly important in efforts to understand changes and achieve improvements in the structure and in the well being of American agriculture.

Some illustrative examples of Division research contributions during the reporting period follow.

Our 100,000 largest farms. A special study of the Nation's 102,000 largest farms--those with marketings of \$40,000 or more--shows three important facts. First, an increasing proportion of the marketings from all U. S. farms is coming from farms with sales of \$40,000 or more: 33 percent in 1959 as compared with 16 percent in 1939. Second, this increase is mainly due to the expanding number of farms in this group rather than to the increasing value of sales per farm. From 1939 to 1959, the number of farms with sales of \$40,000 to \$99,999 increased 242 percent but their sales per farm increased only 8 percent. For the same period, the number of farms with sales of \$100,000 or more increased 300 percent, as compared with a 10 percent increase in marketings per farm. Third, in the \$40,000 and over sales group, family farms in 1959 accounted for 40 percent of all farms compared with 20 percent in 1944 (earlier family farm data are not available). Of the 20,000 farms with \$100,000 or more of marketings in 1959, 11 percent were family farms that accounted for 8 percent of all sales from this group. In 1944, there were no family farms with \$100,000 or more of marketings. Of the total marketings of all U. S. farms in 1959, family farms contributed 70 percent, compared with 66.5 percent in 1944. Family farms are more than holding their own in the rapidly changing, highly technological, and increasingly specialized farming in America today.

Research aids Southeastern grain rate reduction. In a recent final decision, the Interstate Commerce Commission permitted Southern Railway to reduce freight rates on feed grains shipped into the 9 Southeastern States by 53.5 percent, a substantial reduction benefiting both this heavy Southern grain importing area and the heavy grain producing areas of the Midwest. The Secretary of Agriculture, as permitted by law, entered the case in support of the applicant. The key issue was the volume of grain moving by unregulated trucks, for which no dependable data are available. On the basis of data, methodology, and testimony of an expert witness supplied by the Division at the Secretary's request, the Commission (a) accepted applicant's estimate that in 1960 more than 6 million tons of feed grain, or 60 percent of the total grain traffic, moved into the Southeast by truck compared with only 700,000 tons in 1955 and (b) officially approved the ERS method for estimating in-shipments by determining grain deficits computed from ERS data on grain-consuming animal units in each affected State. As a result,



other railroads are reported to be preparing rate reduction applications using ERS data and methodology.

Insurance protection for farmers operating recreational enterprises.

Farmers establishing income producing recreational enterprises often do not realize the legal liability they assume for injury to, or damage to the property of, their customers and others. To provide essential information on this subject to the growing number of rural families operating or considering the establishment of recreational facilities for additional income, a report was prepared explaining (a) the liability involved when farmers operate recreational facilities, such as those sponsored under the Rural Areas Development program, and (b) the type of insurance needed to provide financial protection against lawsuits arising from their use by fee-paying guests, with typical premium costs, by type of activity and for combinations of activities. A widespread demand for this publication has resulted. Materials were furnished to the three principal casualty insurance rating organizations in aid of their efforts to work out better arrangements for insuring recreational enterprises.

Weather and crop yields. In a study of the influence of various factors on corn yields in Iowa, a method was developed by which the effects of weather on aggregate crop yields and production for a State, region, or the Nation as a whole, can be separated with reasonable accuracy from the effects of improved practices and other influences. Such separation is essential for dependable analyses of the impacts of technological advance on agriculture, especially for estimates of future yield trends and production potentials. The method developed is not subject to serious weaknesses inherent in other methods previously used. The Iowa study showed that for the period 1929-60, weather was a comparatively minor influence on aggregate yield variability, having been far overshadowed by the effects of improved varieties, higher plant populations per acre, higher fertilizer use rates, and other improved farm practices. Also, improved technology has reduced yield fluctuations due to weather. The study indicated that Iowa corn yields increased in two steps--the first between 1935 and 1940 as hybrid corn came to be widely adopted, and the second beginning around 1954 due to improved fertilization and other practices.

Lake States dairy adjustments. A regional study of dairy farming in the Lake States has indicated the probable overall impacts if all dairy farms were organized in a manner to maximize farmers' net incomes. The area studied includes major portions of Michigan, Minnesota and Wisconsin and smaller portions of Illinois and Iowa. Although fluid milk is supplied to a number of Federal Order Markets, the Chicago Order Market dominates much of the area. A considerable part of the milk production in the region goes into production of manufactured milk products including butter, powder, ice cream, and cheese.

With some increase in demand probable, and under assumptions of improved technology, full utilization of labor, and use of substantial credit, it would be profitable for Lake States farmers to increase production of milk more than 40 percent by 1965. A substantial increase in milk production would be profitable even with a considerable shift to hog and cattle feeding by farmers in the better soil areas of the region, principally in Illinois, Iowa, and south central Minnesota. In view of a limited demand potential, however, production increases in some parts of the region would need to be offset by decreases in other areas to balance regional supply and demand.

The analysis indicates three profitable adjustments to be of major importance in the Lake States dairy region: (a) Grade A producers generally could provide an increased supply of milk as their competitive position in dairying is strong relative to Grade B producers. This is true even with a reduction of about a third in the historical price premium of fluid eligible milk over milk used for manufactured products. (b) Many Grade B dairy farmers would find it profitable to decrease milk production and increase beef and hog feeding. An increase in these livestock enterprises would also be profitable on some Grade A dairy farms in the Corn Belt type soils of the region. (c) An increase in cow quality and herd size would be profitable on those farms staying in dairy production. On larger, better financed farms, a substantial increase in labor-saving loose housing and milking parlor combination would also be a profitable adjustment.

The largest increase in milk production would be profitable in Michigan where livestock alternatives to the dairy enterprise are limited. This indicated increase in Michigan milk production results in part from a historically "higher priced fluid market" than is the case for other markets within the region. Even though this "higher priced fluid market" is limited, a substantial increase in milk production in Michigan would be profitable.

Indicated reductions in milk production on farms on the Corn Belt type soils of the region are indicative, at least in part, of the strong competitive position of cash crops and non-dairy livestock enterprises. The study suggests that a number of smaller farms in east central Minnesota and west central Wisconsin cannot be organized to provide adequate incomes largely because current land and capital do not provide an adequate base from which to make profitable adjustments. These farms will probably be consolidated into larger units eventually.

Credit, farm income, and farming adjustments. A study completed in Michigan showed that farmers who made substantial gains in asset ownership, net worth, and net income from 1954 through 1958 used on the average three to four times as much credit and used a higher proportion for investment capital than did their low-gain counterparts.

Large farmers increased their net worth an average of about \$30,000 or 54 percent. Something more than half of this increase was due to price

inflation but, even so, in constant 1953 prices, their net worths increased \$10,000 or 18 percent. Their average net incomes in 1958 were 26 percent higher than in 1953. Small farmers increased their net worths an average of about \$12,000--64 percent in current prices--or \$6,500--34 percent in constant prices.

Small farmers were able to borrow and to effectively use large amounts of loan funds, amounts nearly equal to the borrowings of large farmers. Over the period, small farmers acquired loans of about \$18,000, and their outstanding indebtedness at the end of the period had risen some \$8,000. Large farmers borrowed about \$20,000, and their indebtedness increased about \$8,500. For both groups, the indebtedness at the end of the period was more strongly based than at the beginning of the period because of the substantial rise in farm earnings that occurred.

Also studied were farmers who were adjusting their farms rapidly as compared with farmers who changed relatively little. One of the findings was that credit use was closely associated with farm enlargement and improvement. Thus the "low change" small farmers borrowed less than half as much as the "high change" small farmers over the period, and showed a slight decrease in outstanding debt compared with a \$17,000 increase for the high change group. The net worths of the small change group increased \$6,000 (current dollars), while the small farmers in the high change group improved their net worths by \$18,500.





AREA NO. 1. AGRICULTURAL ADJUSTMENTS, PRODUCTION  
RESPONSE AND FARM PROGRAM APPRAISAL

Problem. A chronic major problem in agriculture is to adjust production, both in the aggregate and for major commodities, to market outlets. Achievement of economic balance in agriculture and adequate returns to farmers is likely to be especially difficult over the next five to ten years because the capacity of agriculture to produce probably will more than keep pace with the food and fiber requirements of the anticipated larger population. Some resources now used in over-expanded lines of production need to be shifted or be more efficiently used. Individual farmers can reduce costs per unit of product by reorganizing farm enterprises, adopting improved technology, and increasing the size of their farms. But when many farmers do this, total output mounts and the problem of bringing total supply in line with total demand is intensified. Thus adjustment opportunities cannot be considered solely from the viewpoint of the individual farmer. National and regional aggregate production response are important in considering the farm adjustment problem. Analyses of profitable adjustments on representative farms and estimates of both the aggregate output that would be forthcoming if all farms were efficiently organized and operated, and the aggregate response that farmers may be expected to make, are needed as a basis for evaluating the adjustments that would be profitable both to individual farmers and to the industry under different economic situations and for appraising the effects of alternative farm adjustment programs. Continuing analysis of trends in farm output and resource productivity is also needed to measure changes in the farm situation.

USDA PROGRAM

The program encompasses four major types of work. Studies of national and regional productivity conducted in Washington, D. C. analyze the factors responsible for changes in total output and resource productivity for the Nation and for 10 broad farm production regions. These studies become the basis for long-term projections of prospective trends in farm output and productivity, in numbers of farms, and in other major characteristics of the Nation's agriculture. Studies of production response and needs for adjustment are conducted in Washington, D. C. and at six field locations. These studies emphasize the methodological developments required to appraise the production response farmers are likely to make individually and in the aggregate to changes in technology, prices, programs, and other factors. Attention is also given to the optimum (least cost) regional distribution of crop and livestock production. Area adjustment studies in feed-livestock, dairy, wheat, cotton, and rice areas emphasize the determination of the most profitable adjustments for numerous representative farms to alternative combinations of prices. The most profitable organizations weighted by the proportion of the population represented by each typical farm provide first approximations of the area implication of individual farm adjustments. These

studies are conducted in cooperation with 15 State agricultural experiment stations in dairy areas, 12 in cotton areas, 11 in wheat areas, and 22 in feed-livestock areas. Studies of adjustment opportunities in rice areas are conducted in Arkansas, Louisiana, Mississippi, and Texas. Studies of agricultural policies and program appraisals are oriented toward an understanding of the impacts and means of improving programs and policies at the national level, including the acreage allotment programs, wheat programs, the probable effect of alternative sugar quota and pricing policies, prospective use of land released from the Conservation Reserve, and impacts of the current feed grain program. This work involved formal cooperation with 12 State experiment stations.

A total of 60.6 Federal professional man-years are devoted to this area of work: 4.0 man-years to national and regional productivity; 14.2 man-years to appraisal of production response and needs for adjustment; 5.1 man-years to appraisal of adjustments in dairy areas; 7.2 man-years to adjustments in cotton areas; 7.0 man-years to adjustments in wheat areas; 2.8 man-years to adjustments in rice areas; 10.7 man-years to adjustments in feed-livestock areas; 3.6 man-years to appraisals of agricultural policies and programs; and 6.0 man-years to program leadership.

#### REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

##### A. National and Regional Productivity in Agriculture

Preliminary estimates for 1963 indicate that farm output may be about 9 percent above the 1957-59 average, or slightly higher than the 1962 record.

Livestock production in 1963 is about 2 percent above the previous high, set in 1962, but crop production was about the same as last year. The peak 1963 livestock production is due to a record output of meat animals, and poultry and eggs. Dairy products may decline slightly. Total crop production may slightly exceed the 1961 output and about equal the 1960 and 1962 records. Feed grains, food grains, sugar crops and oil crops were the only groups of crops to exceed last year's production. Stepped-up acreages of these crops is the major factor in the additional production. Sugar crops and oil crops are the only groups to set new levels of output. Total cropland used for crops in 1963 is 2 percent greater than in 1962, but 6 percent less than the 1957-59 average. Over-all crop production per acre is the second largest of record, only 2 percent below last year's high.

The volume of inputs used in agriculture in 1962 remained at the 1961 level.

However, these inputs were the most productive of record--1 percent greater than the previous high of 1961, and 7 percent greater than the 1957-59 average. Since 1957-59, farm output has increased 8 percent but the volume of physical inputs used has increased only 1 percent. The composition of inputs continued to move toward more purchased inputs and less labor. Purchased inputs in 1962 accounted for about two-thirds of all inputs used in agriculture as compared with only 46 percent in 1940.

A study of production capacity and aggregate resource adjustments in U. S. agriculture is underway, in cooperation with The Oklahoma Agricultural Experiment Station. The objectives are (1) to define the magnitude of the gap between aggregate production capacity and utilization of farm products, at various price levels, (2) to quantify the relationship between farm inputs and aggregate output, relating resource adjustments to excess capacity in agriculture, and (3) to analyze the effect of economic conditions in the non-farm sector on farm resource adjustments.

A manuscript covering the first phase of this study is being reviewed under the title "Excess Capacity in U. S. Agriculture." Definitive research on the magnitude of excess capacity is necessary in order to relate overcapacity to resource levels and combinations, and to determine resource adjustments necessary to bring production in line with utilization. In this study, overcapacity is defined as the excess of production over utilization at socially acceptable prices. "Excess of production over utilization" is total Government diversion of commodities from regular market channels. "Socially acceptable prices" are assumed to be national average farm commodity prices resulting from Government stabilization of prices through CCC, acreage diversion, and export programs.

The procedure used was to measure the adjustment gap annually over the period 1955-62 in terms of value of production diverted from the commercial market by Government storage operations, land withdrawal programs, and subsidized exports. The sum of the values of these diversions, at current prices, for all major farm commodities is defined as aggregate excess production, and the ratio of these values to the value of total agricultural production is the adjustment gap in each particular year. If we assume that all Government exports and subsidized commercial exports are components of surplus production, the resulting overcapacity was about 8 percent in 1955-56 and reached a peak of 13½ percent in 1958-59. If we assume, alternatively, that such exports return a value to the U. S. in building subsequent dollar markets for U. S. products and meet other policy objectives, our agricultural overcapacity is less. This alternative calculation, and perhaps the most reasonable estimate, shows an excess ranging from about 5 percent in 1956-57 to about 11 percent in 1958-59. The gap has remained at slightly over 7 percent for the last two years.

Research is continuing on measuring the influence of weather on agricultural output. A study of the effects of weather on corn yields in Iowa was published. Weather indexes, which can be used to adjust actual corn yields for the influence of weather, were constructed for the period 1929-60. Variation in the adjusted yield series is an estimate of the effects of improved technology. The results of this study indicate that corn yields have advanced in two steps. Yields between 1929 and 1935 were relatively stable, around 36 bushels per acre. Chiefly as the result of the adoption of hybrid seed, yields increased substantially between 1935 and 1940. Yields remained at this new level, around 53 bushels per acre, throughout the 1940's and early 1950's. Beginning in 1954 a second period of rapid increase in yield began.



The techniques used in the Iowa study are currently being used to measure the influence of weather on corn yields and production in the Corn Belt farm production region. Preliminary results indicate that the pattern of yield increases in the Corn Belt region as a whole is similar to that found in Iowa.

A manuscript dealing with the methodological problems involved in measuring the effects of weather has been submitted for publication in the Journal of Farm Economics. The analysis presented in this article indicates that multiple regression studies of crop yields and individual meteorological variables are not very helpful in analyzing aggregate changes in yield and production. The multiple regression technique seems to be most useful at the micro-level of analysis, while a weather index approach is more suitable at the macro level.

As part of the work being carried on under the leadership of the ERS Committee on Economic Projections, farm output, inputs and productivity projections are being developed for 1968. Under the assumption that present farm programs will remain in effect, total farm output is projected at about 15 percent above that in 1962. Population is expected to increase 10 percent in this period. Meat animal output is projected at 17 percent, and poultry and eggs at 13 percent, above 1962. Crop production is projected at 16 percent above 1962, with oil crops up 35 percent, food grains up 29 percent, and feed grains up 19 percent.

A study of long-term projections of production in the Pacific Northwest, undertaken at the request of the Bonneville Power Administrator, was initiated during the reporting period. Available literature has been reviewed and statistical data evaluated as to its usefulness in the project. Research procedures and methodology were discussed with an advisory group of representatives of four State experiment stations, and general agreement reached on the course of the study. All available data on land use, yields, and production for the period 1957 to 1961 have been compiled to serve as a basis for projections by 5-year periods through 1985. On the basis of expected population changes, preliminary estimates have been made of future crop and livestock requirements. Changes in available land resources, primarily new irrigation developments, were analyzed and preliminary estimates made. For most crops and types of livestock, some projections have been made and are being reviewed by representatives of the State stations on the advisory committee.

#### B. Appraisal of Production Response and Needs for Adjustment

Methodological refinements continue to further the potential of formal analyses of aggregate response and of interregional competition. In Minnesota, expectations of future adjustments in dairying are being compared with actual adjustments on about 250 farms in an attempt to determine (1) the reasons why some expectations are not realized and (2) the characteristics of those farms and farmers with varying degrees of response to price

changes. In Michigan, actual adjustments made on a sample of 200 farms are being compared with adjustments computed to be most profitable on these farms. Similar work is being conducted in Ohio. The objective of these studies is to determine for prediction purposes a more realistic set of constraints to be imposed upon profit maximizing processes.

Clarification of technical differences in research methods has improved the understanding of conditions under which there would be no discrepancy, or aggregation bias, between the results of supply analyses conducted at the regional or aggregate level and the results obtained from summation of individual farm analyses. These findings are described in a forthcoming paper "On Aggregating Linear Programming Models of Production."

A study of interregional competition is being conducted in Iowa. The analysis is concerned with 157 regions for crops and 20 regions for livestock. Its purpose is to determine the effects of changes in technology, demand, transportation costs, and production control programs, on the comparative advantage of alternative production areas for livestock, feed grains, wheat, soybeans, cotton and forages. The data have been collected and the model constructed. Computation will begin soon.

#### C. Appraisal of Adjustments in Dairy Areas

A probability sample of all or major portions of Michigan, Minnesota, and Wisconsin and smaller areas of Illinois and Iowa, was surveyed in a cooperative regional dairy adjustment study. From this survey, 80 representative resource situations were defined. Profit maximized farm organizations were computed for each typical farm for 36 combinations of milk and hay prices, and the resulting supply relations were weighted according to the population they represented to form area supply relations.

In order to investigate the aggregate effect of each farm attempting to organize in a most profitable manner, demand for milk was projected to 1965, and demands and supplies of milk were equated in an equilibrium analysis. Projection of the demand for all milk indicated a slight increase in total demand despite a substantial per capita reduction in the demand for fluid milk and cream, and a smaller per capita decline in the demand for manufactured milk products. Projected population increases of about 10.3 percent nationally more than offset the projected decline in per capita consumption of manufactured milk products between 1959 and 1965. As a result, demand for manufactured milk products was projected to increase 5.5 percent from 1959 to 1965. Total demand for fluid milk and cream, however, was projected to decline slightly (1.1 percent), due largely to the decline in per capita consumption. Profitable adjustments were then evaluated within the requirement that supply must equal demand.

The analysis indicates that three profitable adjustments are of major importance: (1) Grade A producers generally can provide an increased supply of milk, as their competitive position in dairying is strong relative to Grade B

producers. This is true even with a reduction of about one-third in the historical price premium of fluid eligible milk over manufacturing quality milk. (2) Many Grade B dairy farmers will find it profitable to decrease milk production or eliminate the dairy enterprise completely and to increase beef and hog feeding. An increase in these livestock enterprises would also be profitable on some Grade A dairy farms located on the Corn Belt-type soils of the region. (3) An increase in cow quality and herd size would be profitable on those farms staying in dairy production. On many larger, better financed Grade A dairy farms a substantial increase in labor saving, loose housing-milking parlor mechanization would also be a profitable adjustment.

The largest increase in milk production would be profitable in Michigan where livestock alternatives to dairy are limited. This increase in Michigan milk production would result in part from a historically "higher priced fluid market" than is the case for other markets within the region. Since this higher priced fluid market is obviously limited, it cannot absorb a major increase in the supply of milk. However, a substantial increase in milk production in Michigan would be profitable even with (a) zero intra-regional price differentials for milk and (b) a lower than 1959 Class 1 utilization rate for fluid eligible milk. The latter two conditions would also enhance the competitive position of Wisconsin and Minnesota producers relative to the situation with historical intra-regional price differentials.

Reductions in milk production on farms in the Corn Belt-type soils of the region are indicative, at least in part, of the strong competitive position of cash crops and non-dairy livestock enterprises. A number of smaller farms in east central Minnesota and west central Wisconsin cannot be organized to provide adequate incomes largely because current land and capital resources do not provide an adequate base from which to make profitable adjustments. These farms will probably be consolidated into larger units eventually.

In the Northeast, a regional dairy adjustment study similar in nature and scope is being conducted in cooperation with the State experiment stations of Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New York, Pennsylvania, and Vermont. The region was divided into 20 areas. The responsibility for each area is given to the State which has the predominant interest in the area. Data from the random sample of farms were tabulated by area, and the representative strata of farms determined. These model farms represent typical farm situations with respect to type, size, and important resource characteristics for each area.

Most of the input-output and price data have been tabulated for each of the 20 areas. These data reflect the differences in physical production data and price data which have existed in the region over the past several years. These data have been assembled in a manual for use in the construction of linear programming models that will serve as the basic tools of analysis. The input-output data have been tabulated at two levels of efficiency to



permit program solutions of current average adjustments, and potential adjustments approximating those which the top 25 percent of the farmers are currently attaining.

Since the study has a prime objective of evaluating the competitive positions between dairymen in the 20 areas of the Northeast and between the Northeast and other dairy regions, particular care has been taken to reflect the differences between areas that determine economic behavior. For example, intensive work was done with soil scientists and agronomists to estimate the response of different crops to different levels of management. Particular care was taken to insure that not only the level of output was correct, but that the differentials in output between areas reflected the basic differences in climate and soil fertility.

#### D. Appraisal of Adjustments in Cotton Areas

During the year emphasis in the cotton adjustment work has been given to (1) determination of the most profitable combination of enterprises for representative resource situations under specified product price relationships and levels of technology and (2) development of area aggregations for the major products under each of the assumed situations. In general, the work was concentrated in areas in which the analyses were not completed last year. These areas are: Coastal Plains areas of Alabama, Georgia, South Carolina and North Carolina, the Brown Loam area of Mississippi, Central Louisiana, northeast Arkansas, the Delta area of Missouri, the Rio Grande Valley and High Plains areas of Texas and the San Joaquin Valley area of California. Over 20 areas accounting for about 90 percent of the U. S. cotton production are included in the study. Area aggregations and analyses are available for most of these areas. Progress has been made toward a regional summarization of the results of area studies. A brief presentation of a selected example of results of the study follows.

The optimum organizations for an 80-acre farm in the Limestone Valley area of Alabama with five assumed cotton prices are shown in the following table:

Optimum organization for 80-acre farm, one-man resident labor supply, specified prices for cotton, and advanced technology,  
Limestone Valley areas, Alabama

Item	:Thous.: :units:	Cotton prices (cents per pound of lint)				
		15.6	20.8	26.0	31.2	36.4
Cotton-----	: Acs. :	---	---	39	48	48
Corn-----	: do. :	51	51	15	7	7
Oats-----	: do. :	12	12	16	16	16
Pasture-----	: do. :	10	10	3	2	2
Idle open land-----	: do. :	8	8	8	7	7
Brood sows-----	: No. :	19	19	6	3	3
Net revenue <u>1</u> /-----	: Dols.:	3,955	3,955	4,275	5,794	7,431
Capital:	:					
Investment <u>2</u> /-----	: Dols.:	5,908	5,908	4,001	3,598	3,598
Operating-----	: do. :	2,083	2,083	1,769	1,706	1,706
Resident labor used--	: Hrs. :	1,416	1,416	914	808	808
Seasonal labor used--	: do. :	97	97	183	201	201

1/ Net return to resident labor, management and land.

2/ Investment capital does not include the investment in land.

For this representative farm, the maximum cotton acreage permitted by the agronomic restrictions is in the optimum organization with a 31.2 cent price for cotton. At 26 cents per pound for cotton, all except some lower yielding soils are in cotton in the optimum organization. However, the net revenue, with 39 acres of cotton at 26 cents per pound, is less than 10 percent higher than the organization without cotton. If the price of alternative products were 30 percent higher, the maximum cotton acreage would not be reached at 36.4 cent cotton. But if prices of alternative products were 30 percent lower, the maximum cotton acreage would be in the organization with 20.8 cent cotton. Similar information is available for 3 other resource situations in the Limestone Valley area.

The responses of all of the resource situations in the area are weighted, according to the resources in each situation, to develop aggregations for the area, as in the following table:

Aggregates for specified items, Limestone Valley areas, Alabama  
(advanced technology varying prices for cotton)

Item	:Thous.: :units :	Cotton prices (cents per pound of lint)				
		15.6	20.8	26.0	31.2	36.4
Cotton-----	: Acs. :	---	414	641	847	847
Corn-----	: do. :	796	559	330	64	64
Oats-----	: do. :	227	276	183	190	190
Grain sorghum-----	: do. :	51	31	26	24	24
Alfalfa hay-----	: do. :	83	9	36	120	120
Lespedeza hay-----	: do. :	72	---	105	127	127
Pasture-----	: do. :	169	94	108	65	65
Idle open land-----	: do. :	131	145	101	93	93
Total open land--	: do. :	1,529	1,529	1,529	1,529	1,529
Brood sows-----	: No. :	233	189	113	25	25
Resident labor available <u>1</u> /-----	: Hrs. :	25,156	25,156	25,156	25,156	25,156
Resident labor used--	: do. :	19,042	19,142	17,001	14,041	14,041
Seasonal labor hired-	: do. :	3,738	3,615	4,626	5,848	5,848
Net return to opera- tor labor, manage- ment and land-----	: Dols.:	58,033	65,840	83,628	111,763	141,158

1/ Includes 6,750 part-time operators, 5,840 full-time operators, and 1,710 full-time hired men.

Results similar to those described for the Limestone Valley area are available for several other areas, and will become available for all detail study areas. When work in all areas is completed, a regional summarization will be undertaken.

A study of adjusting to increasing salinity on dry-farmed lands of the lower Rio Grande Valley was initiated during the year. The study is designed to assess the effects of increasing salinity on crop yields and farm incomes as a basis for appraising possible salinity prevention, and reclamation, programs.

#### E. Appraisal of Adjustments in Wheat Areas

A cooperative study of adjustments and potential adjustments in wheat farming is being made in North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Colorado, Montana, Idaho, Washington, and Oregon. These studies have accumulated extensive data on the production situation on typical wheat farms in the Great Plains and the Pacific Northwest. Data are being assembled on costs and on comparative net incomes from wheat and alternative crops under various prices and programs, area by area. These data are basic to analyses of the impact of different kinds of adjustment programs on the production and income of individual farms, and to appraisals of the aggregative effect of such adjustments.

Data and analyses from the wheat adjustment studies in Oregon, Washington, Idaho, Montana, North Dakota, South Dakota, Nebraska, Kansas, Wyoming, and Colorado were used to analyze how wheat farmers would adjust to different wheat programs that have been proposed for solving the wheat problem. These alternative programs include (A) 1961 acreage allotments--wheat price at 75% of parity; (B) acreage allotments reduced 25%--wheat price at 85% of parity; (C) acreage allotments increased 20%--wheat price at 65% of parity; (D) bushel quotas with food wheat priced at 100% of parity, other wheat at 65%, and diversion of 20% of the wheat base; (E) bushel quotas on food wheat priced at 90% of parity; and (F) no acreage or production controls and no price supports. Data from these studies were also used to estimate the area and regional aggregative effects of production adjustments to the different wheat programs.

The study includes data for 65 adjustment areas in a total of 10 wheat producing States in the Plains and the Pacific Northwest. These States produce about 70-75 percent of the wheat in the U. S. The results for the 10 State total are summarized as follows:



Program	Allotment	Wheat price, % parity	Million tons wheat	Feed grain	Total grain	% wheat is of Prog. A
A	1961 acreage-----	75	20.8	25.0	45.8	100
B	Acre - 25% less-----	85	16.0	30.1	46.1	77
C	Acre - 20% more-----	65	24.4	22.2	46.6	117
D	Bushel - Food-----	100	20.1	21.5	41.6	96
	Export-----	65				
	(20% wheat base in CR)					
E	Bushel - Food-----	90	24.2	23.0	47.2	108
F	None-----	None	23.7	24.2	47.9	114

Wheat production under Program A (1961 acreage allotments) and the percentage change under other programs for each of the 10 States would be as follows:

State	Prog. A (1961 allot.)	Prog. B (25% lower allot.)	Prog. C (20% higher allot.)	Prog. D (Food & Export Quota)	Prog. E (Food Quota)	Prog. F (No controls)
	Mil. Bu.			Percentage Change		
Oregon-----	26.3	-22	+18	+19	+31	+41
Washington---	63.7	-25	+17	+24	+53	+53
Idaho-----	<u>42.7</u>	-25	+20	+44	+79	+79
3 States---	132.7	-24	+18	+29	+57	+59
Montana-----	64.3	-25	+20	+ 7	+28	+28
No. Dakota---	136.8	-21	+18	-29	+25	+25
So. Dakota---	<u>37.5</u>	-19	+15	-15	-12	-12
3 States---	238.6	-22	+18	-17	+20	+20
Nebraska-----	82.2	-25	+20	-16	- 5	-22
Kansas-----	183.0	-23	+14	- 4	+ 1	- 4
Wyoming-----	4.4	-24	+16	-31	-21	-51
Colorado-----	<u>52.4</u>	-25	-21	+ 2	-17	- 2
4 States---	322.0	-24	+16	- 7	- 4	- 9
10 States---	693.3	-23	+17	- 3	+16	+14

Feed grain production under Program A (1961 acreage allotments) and the change under other programs for each of the 10 States would be:

State	: Prog. A : : (1961 : allot.) : :	: Prog. B : : (25% : lower : allot.) : :	: Prog. C : : (20% : higher : allot.) : :	: Prog. D : : (Food & : Export : : Quota) : :	: Prog. E : : (Food : Quota) : :	: Prog. F : : (No : controls) :
	: Thous. : tons : :	<u>Percentage Change</u>				
Oregon-----	: 650 : :	: +21	-18	-47	-40	-35
Washington---	: 919 : :	: +30	-31	-70	-71	-71
Idaho-----	: 673 : :	: +23	-19	-81	-81	-81
3 States---	: 2,242 : :	: +25	-24	-67	-65	-64
Montana-----	: 1,210 : :	: +41	-34	-57	-70	-70
No. Dakota---	: 3,735 : :	: +25	-21	- 5	-32	-32
So. Dakota---	: 4,513 : :	: + 7	- 4	0	+ 4	+ 4
3 States---	: 9,458 : :	: +18	-15	- 9	-19	-19
Nebraska-----	: 6,720 : :	: +12	- 8	- 2	+ 5	+18
Kansas-----	: 5,787 : :	: +28	- 6	-22	+ 8	+13
Wyoming-----	: 36 : :	: +25	-17	0	+28	+61
Colorado-----	: 756 : :	: +62	0	+43	+63	+59
4 States---	: 13,299 : :	: +22	- 6	- 8	+10	+18
10 States---	: 24,999 : :	: +21	-11	-14	- 8	- 3

Under Program B (reduced wheat allotments and higher prices), wheat production would be reduced in about the same proportions in all 10 States, but the associated expansion in output of feed grains (averaging 21 percent) would be greatest in Colorado (62%) and Montana (41%), and would be least in South Dakota (7%) and Nebraska (12%).

Under Program C (increased wheat allotments and lower prices), wheat production would increase in about the same proportions in all 10 States but the associated contraction of feed grain production would be greatest in Montana (-34%) and Washington (-31%), and it would be least in Colorado (no change), Kansas (-6%) and South Dakota (-4%).

Under Program D (bushel quotas on food and export wheat), wheat production would increase in the 3 Pacific Northwest States and Montana, and would decrease in the other 6 States. In these States barley is a poor alternative to wheat even when the wheat is priced as feed. In Colorado, wheat even at a feed price is more attractive than grain sorghum. In the 4 States, North Dakota to Kansas, feed grains (corn in the North and grain sorghum in the South) pay better than wheat at a feed price.

Under Program E (bushel quotas on food wheat) total wheat production would increase sharply (about 60%) in the Pacific Northwest and moderately in Montana (28%) and North Dakota (25%); it would not change in Kansas and would decrease in the other States. Associated with these changes would be a decrease in feed grain production in the Pacific Northwest, Montana and North Dakota, and an increase in feed grains in the other (mainly grain sorghum producing) States. As a total for the 10 States, wheat production would increase 16 percent and feed grain production decrease 8 percent; these are adjustments similar to those under Program C (20% larger wheat allotments).

Under Program F (no controls and no price supports) wheat production would also increase in the Pacific Northwest, Montana and North Dakota, and decrease in the other States, but the decrease in Nebraska and Wyoming would be greater and the decrease in Colorado would be less than under Program E.

Total production of grain (wheat plus feed grain) would be greater (than with 1961 allotments) under Programs B, C, E, and F, and would be reduced only with Program D which provides a mandatory diversion of 20 percent of the wheat base acreage.

The impact of Program B would be to solve the wheat surplus problem but let feed grain production increase. Program C would produce wheat in excess of domestic and export needs, but it would be less expensive wheat--about \$1.65 a bushel; it would be expensive feed grain. Programs E and F would solve the wheat surplus problem and would reduce the production of conventional feed grains, but would substitute the production of feed-priced wheat for some conventional feed grains. Only Program D with its mandatory land retirement program would reduce both wheat and feed grain production. The program effect on the wheat-feed grain situation would differ by regions.

In the Pacific Northwest, total grain production would be reduced by any program that shifts land from wheat into feed grain (mainly barley) or that reduces total grain acreage. Given a choice, farmers tend to produce wheat even at a feed price, instead of barley. Program C (increased allotment) and Programs E and F (which do not control wheat output) would allow increased production of any grain priced as feed.

In the Northern Plains (except Montana), total grain production would be decreased slightly by programs that would shift land from feed grains to wheat, but given a choice, farmers would prefer to grow wheat at a feed price instead of barley. Actually, total grain production would not be affected greatly by shifts between wheat and barley in the Northern Plains. Only land retirement would reduce total grain production significantly.

In the Southern Plains, a shift from wheat to feed grains (grain sorghum) would increase total grain production. Given a choice (as in Programs D, E and F) farmers would improve their incomes by growing grain sorghum rather than wheat at a feed price. Still, many farmers prefer to grow wheat for

various reasons, and would not shift as far from wheat into feed grains as economic comparisons would suggest. Total grain production would be increased under Programs D, E, and F, which would give farmers a choice of what they grow as feed grain.

Plans are underway to analyze the aggregative effect of adjustments to a uniform set of price and program assumptions in all major western wheat producing areas by means of a common econometric model, developed under the auspices of three regional technical research committees. The basic plan is to program the supply response of representative farms and weight them to form aggregates, then adjust the total to derived demand schedules. Data for this effort are available from the cooperative USDA experiment station adjustment studies.

Preliminary results in Kansas show substantial differences in farm organization and in operator earnings when grain sorghum is \$1.00 a bushel and the price of wheat varies from \$1.20 to \$2.00 per bushel. As the price of wheat falls, the additional net income to be gained from hog production rises, and farmers who prefer not to raise hogs give up larger and larger returns to management:

Item	Unit	Wheat priced at			
		\$1.20	\$1.50	\$1.80	\$2.00
<hr/>					
With hogs excluded:					
Wheat-----	Ac.	0	211	459	459
Grain sorghum-----	Ac.	772	400	37	37
Cattle-----	No.	93	63	48	48
Operator labor-----	Hrs.	1,984	1,674	1,335	1,335
Return to management---	Dols.	1,581	2,512	4,860	6,780
Hogs permitted:					
Wheat-----	Ac.	0	190	400	457
Grain sorghum-----	Ac.	712	400	133	37
Cattle-----	No.	86	62	50	48
Sows (2 litters)-----	No.	37	23	7	2
Operator labor-----	Hrs.	2,250	2,250	1,726	1,431
Return to management---	Dols.	3,024	3,344	5,023	6,852
Returns to management					
given up when hogs					
excluded-----	Dols.	1,443	832	163	72

Assumptions: Grain sorghum price \$1.00 @ bushel, hogs \$15.50 @ cwt., feeder steers \$23.30 @ cwt., operator labor \$1.12 an hour included in costs.



In southwestern North Dakota (west of the Missouri River), a study was initiated on the economics of adjusting land-use from cash crops to grazing and forage crops. As background information, data were drawn from the office records of farmers and ranchers having Great Plains Conservation Program long-term contracts under PL-1021. A sample of these operators will be personally interviewed to learn their experiences with regrassing. The work has not progressed far enough to have reportable results.

In south central North Dakota, profit-maximizing adjustments were studied on six farms. Results indicated that resources were attracted into crop enterprises before livestock enterprises because of the higher returns on capital inputs. Farm incomes could be increased by a reallocation of resources among enterprises. All except the largest farm could increase its income by using more capital inputs. Forage consuming livestock usually is the first livestock enterprise to attract additional capital.

In eastern South Dakota, data from ASCS records were tabulated from a sample of 4,261 farms, to describe the population of farms for analyzing adjustments. Data included tenure, cropland, open pasture land, wheat base, wheat allotment, 1962 planted wheat acreage, and livestock numbers by classes. A report is being prepared for use by the Extension Service and others.

A survey of wheat-livestock farms in the Columbia Basin of Oregon showed that 80 percent had cow-calf operations, 14 percent had cow-yearling operations, and 6 percent were purchased steer operations. The interrelationships between wheat and livestock enterprises in the farm-ranch organization are being studied. Sixty-six farmers were interviewed to obtain input-output data and resource information. Budgets for 9 different wheat-livestock situations are being studied. Work on this new study has not yet reached the point of reportable results.

In Idaho work has proceeded with assembling basic data. Supplemental data were obtained by means of a mailed questionnaire to one-fifth of the wheat farm operators listed on ASCS rolls. The information from the two sources is being combined and summarized to provide an economic description of wheat farms by size in Idaho. This data will be useful in estimating the aggregative effect of adjustments programmed on representative farms. Also the data are being assembled in a report to be published for use within Idaho. Enterprise input-output data from earlier studies are being readied for use in programming typical farms.

Findings from earlier analyses of opportunities for wheat adjustments in Washington were incorporated in a manuscript now nearly completed. The focus is on the effect of different proposed wheat programs on wheat production and on farm income. The analysis has proceeded to the detailing of feasible crop and livestock enterprises and preliminary programming analysis to provide a better basis for selecting farm types and resource limits. Plans are laid for coordinating the study with similar studies of wheat areas in Oregon and Washington.

F. Appraisal of Adjustments in Rice Areas

The development of input and output data for major farm enterprises, reflecting both present and advanced levels of technology, which was started last year, has been continued and has been essentially completed for all southern rice producing areas. Considerable progress has been made in the analyses to determine the most profitable combination of enterprises on representative farms under several specified conditions as to product price relationships and levels of technology.

Preliminary analyses indicate that with improved management and technology, with both rice and beef cattle the complementary effects of the two are less important than was true with the rotations under the old rice-beef cattle systems. Greater use of chemical fertilizer, the use of herbicides for grass control in rice, and the use of the newly released 100 day varieties which permits two crops of rice to be harvested on the same land in one year, substitute for some of the complementary effects of beef cattle in the rotation system. It is estimated that about 50 percent of the land planted to rice in Texas will produce two crops in 1963. The State average yield is expected to be about 25 percent higher than the average of 3 or 4 years ago before these practices were in general use. These changes in rice technology partially explain the fact that rice and beef production are becoming increasingly separate and independent operations in Texas and Louisiana areas. This trend is indicated by the fact that some farms specialize in growing either rice or beef cattle. And, on large holdings, separate management is frequently provided for each enterprise.

G. Appraisal of Adjustments in Feed-Livestock Areas

A study of the effects of alternative levels of grazing fees and grazing privileges on ranch organization and net returns in public land areas was completed and an administrative report was submitted to the Bureau of Land Management and the Forest Service. The Bureau of Land Management made extensive use of the report in public meetings and conferences in which consideration was given to the official action of increasing the grazing fee on lands administered by the Bureau of Land Management. A total of 1,500 copies of the administrative report was distributed to leading ranchers and administrators of public lands. A full research report has been prepared and is being reviewed for publication as a USDA bulletin. Further more detailed analyses have been made of the organization, costs and returns in 1960 on cattle and sheep ranches in four ranching areas. Three reports: "Economics of Cattle Ranching on Federal Rangelands - Southern Intermountain and Southern Desert Areas," "Costs and Returns of Cattle Ranches Using Public Grazing Permits - Northwest Mountain and Northern Great Plains Areas", and "The Economic Characteristics of the California Livestock Industry and Historical and Current Factors Affecting Investment, Cost and Income" are being prepared for publication.

The results of a study of drought adjustment practices used by ranchers and optimum livestock inventory managements on ranches in New Mexico were published in a research bulletin by the New Mexico Agricultural Experiment Station. A report "Comparison of Alternative Beef Cattle Systems for Western South Dakota Ranches" is being reviewed for publication. The results of these studies have been especially helpful to the Bureau of Indian Affairs and the Missouri River Basin Investigations.

New studies of production problems and adjustments on range-livestock ranches were started in Oregon, California and Texas. This type of study, when expanded to other areas, will provide a basis for regional aggregation comparable to the regional studies in the dairy, wheat, cotton, and Corn Belt regions.

Farm surveys, assimilation of secondary data, and linear programming analyses are being conducted in most of the States in a region either in or bordering the Corn Belt, and whose farmers produce substantial quantities of feed grains, beef and hogs. Projects in which the Division has active participation are located in Illinois, Indiana, Iowa, Nebraska and South Dakota. A related research project in Ohio is closely coordinated with this work. The research program includes construction of probability sampled representative farms throughout the study area. Major resources are determined through farm surveys and tabulation of data from the Census, ASC offices and tax assessment files. These data provide the basis for constructing representative resource situations. Using these resource situations as benchmarks, a comparable set of crop and livestock production alternatives are considered for each. Specific crops, yields and production practices considered are those appropriate to the sub-areas studied. Although most livestock enterprise alternatives are standardized for the region, local differences in feeding, housing or other practices are allowed when appropriate. Local cost and price differentials are also considered when appropriate. In the initial analysis, transfer of land is not considered as an alternative. Factor and product prices as well as scope of adjustment alternatives are determined in terms of a 1970 target date.

Profit maximizing farm organizations are determined by a procedure of linear programming. For each representative farm, profit maximizing organizations are determined for 3 prices for hogs, 3 prices for beef, and 3 prices for feed grains, for a total of 27 price combinations. This procedure of analysis is then repeated allowing the transfer of land as an additional alternative. When analysis of representative farm situations is complete, supplies of hogs and beef cattle will be aggregated for areas within States, for whole States, and for the entire region. This will be done in order to determine which supplies of these products, and consequently which adjustments on representative farms, are consistent with the factor prices assumed and the aggregate demand for these products.

Progress by individual States is as follows:



Iowa. A total of 67 representative farm situations have been defined in 10 production areas of the State. Most of the crop costs, yields, capital and labor requirements, and livestock coefficients required for the programming analysis are complete but programming analysis has not yet begun.

South Dakota. Survey data have been acquired from a sample of about 700 farms in the eastern half of South Dakota. Currently, these farms are being stratified by size, livestock enterprises, labor availability, and soil type in order to define representative resource situations. Construction of representative farm situations is scheduled to be completed by Spring, 1964.

Nebraska. Survey data have been acquired from 3 major farming areas in the State. These include Economic Areas 3B, 5 and 7 in southern and north central Nebraska. About 175 survey records were obtained in each of the 3 areas. Survey data from Economic Areas 5 and 7 have been tabulated and representative resource situations constructed. Programming analysis of these two areas will begin shortly. Representative farms in other major beef-hog areas of Nebraska will be defined largely from secondary data.

Illinois. Survey schedules from two major beef-hog areas in Illinois have been summarized and representative resource situations have all been defined on the basis of farm size, farm type, and tenure. Linear programming analysis of these representative resource situations is underway and will be completed during the next year.

Indiana. Farm survey work in Indiana is complete. Approximately 700 schedules were obtained representing 7 types of farming areas in the State. Data are currently being tabulated for construction of representative resource situations. Some linear programming has been done for a study area in northeastern Indiana, and two manuscripts reporting the results are currently in press. Remaining programming analysis should be completed during the next year.

Other States. Programming analysis for 24 representative farm situations in south central and southwestern Minnesota is now complete, as is the analysis for the beef-hog areas of lower Michigan. Representatives from other States are not as far along with their analyses but farm surveys are complete or virtually complete in all States. Results of the analysis are too fragmentary at this time to warrant inferences about the findings.

Feeding and fattening of cattle in the South Platte Valley of Colorado expanded more rapidly in the 1950's and early 1960's than it did in the rest of the United States. Cattle feeding, directly or indirectly, is the major source of agricultural income within the area. Cattle feeding is becoming concentrated in the hands of the larger operators (500 head or more a year), which has changed and is changing the internal structure of the area's agriculture. These changes are partly the cause and partly the result of changes in the marketing of cattle and beef. At one time most of the fattened cattle and a considerable fraction of the feeder cattle were sold through

central markets. Now many of the fed cattle are sold direct to packers or chain grocery buyers, and many of the feeder cattle are sold through country auctions or sold directly from the rancher to the feedlot operator. The large cattle feeders are able to supply large lots of fed cattle finished to a uniform weight and finish.

A report "Changes in the Cattle Feeding Industry in Nebraska" was prepared using data mainly from secondary sources. In addition, studies are under way on the economies of various feeding systems and the economies of scale of 104 farmer-feeders (who feed 50 to 400 head of cattle per year) and of 47 commercial feeders (who feed more than 400 head a year). The smaller farmer-feeders make extensive use of coarse, nonmarketable feed such as crop aftermaths, an economy not available to commercial feeders.

In western South Dakota a study is being initiated to learn the complementary relationships between irrigation farming on the Belle Fourche Irrigation Project, dryland grain farming, and ranching. Plans are to interview 50 farmers and ranchers.

Economic analysis of cattle-wintering trials conducted at the Newell, South Dakota Experiment Station showed that high concentrate-low forage rations are economically practicable when hay supplies are short and high priced due to drought. When hay is available and normally priced, it is the most economical wintering feed.

In a study of the economics of beef production in farming systems in the Mississippi Delta, linear programming techniques have been applied on 5 representative farm situations, with beef cattle, to study profitable adjustment possibilities. Input and output data for pastures developed in one phase of this study have been used. Some of the results of these programs are: Oats, largely for winter grazing, replaced corn on sandy soils on sandy-land farms and on farms which have levee land; oats replaced soybeans on loam soils on the sandy-land farm and on farms with levee land; pasture, mostly Coastal Bermuda, replaced soybeans on poorly drained soils on all farms; Coastal Bermuda replaced all "summer sods" except levee pastures on all farms.

#### H. Appraisal of Agricultural Policies and Programs

Appraisal of farm programs draws heavily on the adjustment studies previously described, but specific references to them are not included in what follows:

1. Study of the 1962 Feed Grain Program. Data were obtained from about 2,200 farmers in samples drawn to represent the Corn Belt, the Pacific Northwest Barley Area, the Texas High Plains Grain Sorghum Area, and a deficit feed grain area in east central North Carolina. The data were edited and transferred to punched cards. Preliminary analysis indicated that among the areas: (1) the proportion of the farmers planning to participate in 1963 was from 2 to 10 percentage points lower than in 1962; (2) from 43 to

86 percent of the 1962 participants, and from 5 to 22 percent of the 1962 nonparticipants, in these five areas planned to participate in the 1963 Feed Grain Program; (3) from 28 to 78 percent of those planning to participate intended to divert the minimum, and from 13 to 53 percent intended to divert the maximum, acreage; (4) from 21 to 57 percent of the farmers interviewed were interested in pasturing diverted acres under a one-year program, and from 12 to 51 percent under a 5-year program. These results were promptly made available to, and used by, program administrators.

2. Study of Land Retirement Programs. Work was completed on the study of farmers' plans for use of land following its release from Conservation Reserve contracts. The analysis indicated the degree to which farmers were interested in new land retirement contracts. In four of the six areas studied, whole-farm contracts were preferred by about three-fourths of the land that farmers were interested in placing under new contracts, and part-farm contracts for the other one-fourth. In two areas with large acreages of high-value allotment crops, a majority of the farmers preferred part-farm contracts. About 70 percent of the land which farmers in all six areas said they would place under new land-retirement contracts, had previously been under Conservation Reserve contracts. The variety of responses to new contracts indicates that, to be most effective for the least cost, a land-retirement program needs to offer several optional combinations of required adjustments and levels of payment.

An analysis of farmers' plans for retired and diverted land, and of their interest in alternative land input-restricting programs, indicates the possibility of longer term land use adjustment programs. Some preliminary developmental work was done on the feasibility and cost of long-term land contracts without a set termination date under which farmers could make any use of the land consistent with maintaining a soil conserving cover.

3. Aggregate Output Response to Alternative Wheat Programs. The aggregate supply responses for western States to alternative Government support and control programs for wheat have been checked and are being prepared for publication. Preliminary decisions concerning a regional supply model have been made as a result of investigation of the applicability of alternative types of models. Work is proceeding on the development of the model, and plans are being made to gather and assemble the data needed. Once the model is developed and tested, it is anticipated that it will perform the important function of providing more timely estimates than have previously been possible of the effects of existing and proposed programs on farm output and income in the western region.

4. Special Analyses of Proposed and Existing Farm Programs and Policies. A number of special analyses were made by request of the Office of the Secretary or program officials. They included: (1) analysis of alternative payment rates and land response to an expanded land retirement program; (2) expected substitution between wheat and feed grains under proposed provisions for an expanded feed grain program; (3) farm output and income on typical



farms resulting from a "Yes" or "No" vote in the 1963 wheat referendum; (4) effect of ACP programs on the production of surplus crops; (5) potential ability of American agriculture to meet the world's food deficit; (6) appraisal of proposed potato programs; (7) evaluation of economic prospects for a sugar beet industry in the Northeast; (8) studies of feed grains and wheat support price differentials; (9) determination of cotton supply response in the Georgia-Alabama area to alternative levels of cotton prices and allotments; (10) evaluation of effects of making allotments negotiable; (11) evaluation of dairy program alternatives; (12) study of provisions of the 1963 Pilot Land Use Adjustment Program; and (13) impacts of farm programs on the family farm.

5. Development of a Regional Model for Analysis of Wheat and Feed Grain Programs. A linear programming model representing the regional production of feed grains, wheat, cotton, and soybeans in the U. S. was constructed during the year, and approximately 18 solutions have been obtained from the model. Results from the model indicate that considerable information has been obtained on the regional adjustments in agricultural output that may be expected in response to farm programs involving adjustments in the production of wheat and feed grains. In the model, the application of these individual programs had considerable effects upon the acreage of other crops being studied. This occurred because of the simultaneous consideration of the substitution of one crop for another in consumption, and the competition among crops for limited resources.

In one particular modification of the model, land was segregated on the basis of quality. This made it possible to estimate the effects of programs which would retire only the marginal lands in each region rather than eliminating an entire region from production if its better land was competitive with other regions. One set of solutions allows the comparison of regional production patterns when variations in demand levels are considered. The changes in demand were assumed to be due to changes in price levels of farm products, and supply and demand were assumed to be in equilibrium at each price level.

6. Economic Analysis of 1964 Wheat Program. The economic analysis of the 1964 wheat program was made to describe the program and provide estimates of what wheat farmers could expect if the wheat referendum passed or failed. Estimated returns on representative wheat-producing farms indicated that the return for operator labor and investment under a "No" vote would be less than half what it would be with a "Yes" vote. Under a "No" vote, many wheat farmers probably would not comply with allotments. This would be to their advantage individually if yields were high because of the small price advantage of compliance. However, such action by many farmers would turn eventually to be a disadvantage for all because of the aggregate overproduction that would result. Results of this study were used extensively by the Department in preparing information materials on the 1964 program.

7. Appraisal of Adjustments on Farms in Northeastern Montana with Conservation Reserve Contracts Expiring in 1963. Interviews were obtained from 67 farmers in northeastern Montana having whole-farm Conservation Reserve contracts expiring in 1963. The purpose of the survey was to determine the attitudes of participating farmers toward the Conservation Reserve, why they participated, adjustments made because of participation, and their future plans after the contracts expired. Most of the participants were well satisfied with their Conservation Reserve contracts and would have liked to have extended them. Many who had livestock enterprises also indicated that they would have kept this acreage in grass if they were partially subsidized. A preliminary tabulation of two sets of paired comparisons indicated the rank of the reasons why farmers participated in the Conservation Reserve. For those that were actively farming at the time of contracting, the three major reasons were: Farm not adequate, conservation and farm improvement, and expected increase in farm income. The major reasons for participation by those not actively farming were: Best income opportunity, farm not adequate, and conservation and farm improvement.

8. Appraisal of Alternative Farm Programs on Great Plains and Pacific Northwest Grain Farms. Studies were made in 8 States in the Great Plains and Pacific Northwest of how various farm programs affect farm income and production, and how model farms adjust to alternative programs. In some States, field surveys were conducted to update farm descriptions and input-output data, particularly concerning livestock enterprises on wheat farms. Some work was completed on detailing existing and feasible livestock enterprises that combine with crop enterprises under existing and proposed programs.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. National and Regional Productivity in Agriculture

- Farm Production Economics Division. 1962. Changes in farm production and efficiency...a summary report. Stat. Bul. 233, Revised.
- Farm Production Economics Division. 1963. Changes in farm production and efficiency...a summary report. Stat. Bul. 233, Revised.
- Farm Production Economics Division. 1962. Index of numbers of farm production, by groups of livestock and crops, for each farm production region, 1939-61. USDA Stat. 233, Supplement.
- Poli, Adon. 1963. Long-term production prospects for western agriculture. ERS, AER-33.
- Shaw, Lawrence H. and Durost, Donald D. 1962. Measuring the effects of weather on agricultural output. ERS-72.
- Starbird, I. R. and Brown, W. H. 1962. Changes in costs and efficiency in cotton production...a preliminary report. ERS, Farm Prod. Econ. Div. Unnumbered.
- Starbird, I. R. and Vermeer, J. 1962. Crop production practices and costs by size of farm, delta area Mississippi, 1957-58. ERS, AER-21.

B. Appraisal of Production Response and Needs for Adjustment

- Day, R. H. 1962. An approach to production response. Agricultural Economics Research. XIV(4). pp. 134-148.
- Day, R. H. 1963. Recursive programming and production response. Book. North-Holland Publishing Company, Amsterdam, The Netherlands.
- Egbert, A. C. and Heady, E. O. 1963. Regional changes in grain production. Iowa State University Center for Agricultural and Economic Adjustment. CAEA Report 14T.
- Schaller, W. N. 1963. Improving the predictive reliability of regional analysis through the use of recursive programming. ERS, Farm Prod. Econ. Div. Mimeograph.
- Taylor, M. M. 1963. Publications containing recent farm enterprise input-output data. ERS, Farm Prod. Econ. Div. Unnumbered.
- Tomkin, J. R. and Sharples, J. 1963. The role of operators' expectations in farm adjustment. Ohio Agr. Exp. Sta. Res. Bul. 936.

C. Appraisal of Adjustments in Dairy Areas

- Dean, G. W., Johnson, S. S. and Carter, H. O. 1963. Supply functions for cotton in Imperial Valley, California. Agricultural Economics Research. Vol. XV, No. 1.
- Holt, James and Sundquist, W. B. 1963. Profit increasing adjustments for Minnesota grade A dairymen. Minnesota Farm Business Notes No. 450.
- Irwin, George D. and McKee, D. E. 1962. Stanchion, herringbone milking parlor or no dairy. Quarterly Bulletin. Mich. Agr. Expt. Sta. Article 45-32.

- Irwin, George D. 1962. Tenure adjustments on Michigan farms. Quarterly Bulletin. Mich. Agr. Exp. Sta. Article 45-19.
- Irwin, George D. 1962. Lower price--less milk. Michigan Farm Economics No. 239.
- Sundquist, W. B. 1962. Expansion plans for dairy-hog farmers. Minnesota Farm and Home Science, Vol. XX, No. 1, pp. 15 and 19.
- Sundquist, W. B., Day, L. M. and Jensen, H. R. 1963. Income-improving farm adjustments in southeastern Minnesota. Minn. Agr. Exp. Sta. Bul. 466.

#### D. Appraisal of Adjustments in Cotton Areas

- Burch, T. A., Lanham, W. J., and Butler, C. P. 1962. Characteristics, resources, and income of rural households, Piedmont Area, South Carolina. S. C. Agr. Expt. Sta. Bul. 500.
- Butler, C. P. and Burch, T. A. 1963. Farming adjustments to meet changing conditions--I Piedmont Area of South Carolina. S. C. Agr. Expt. Sta. Bul. 507.
- Hubbard, J. W., Burch, T. A., and Butler, C. P. 1963. Estimated production requirements and returns from selected crop and livestock enterprises in the Upper Coastal Plain of South Carolina. S. C. Agr. Expt. Sta. A. E. 243.
- Moore, D. S., Tefertiller, K. R., Hughes, W. F., and Rogers, R. H. 1962. Production requirements, costs and expected returns for crop enterprises, hardland soils, High Plains of Texas. Texas Agr. Expt. Sta. MP-601.
- Strickland, P. L., Plaxico, J. S., and Lagrone, W. F. 1963. Minimum land requirements and adjustments for specified income levels, southwestern Oklahoma. Okla. Agr. Expt. Sta. Bul. B-608.
- Strickland, P. L. and Partenheimer, Earl J. 1963. Optimum farm plans and aggregate area production, Limestone Valley Area, Alabama. Agricultural Economics Series I, Dept. of Agr. Econ., Auburn Univ. Auburn, Ala.
- Strickland, P. L. and Partenheimer, Earl J. 1963. Aggregate area production, Limestone Valley Areas of Georgia and Tennessee. Supplement to AES I. Agr. Econ. Mimeo. Dept. of Agr. Econ., Auburn Univ., Auburn, Alabama.
- Sutherland, J. Gwyn. 1963. Farming adjustment opportunities, economic areas 6 and E, North Carolina. N. C. Agr. Expt. Sta. AE Inf. Ser. No. 101.
- White, J. H., Plaxico, James S., and Lagrone, William F. 1963. Influence of selected restraints on normative supply relationships for dryland crop farms on loam soils, southwestern Oklahoma. Okla. Agr. Expt. Sta. Bul. T-101.



E. Appraisal of Adjustments in Wheat Areas

- Rude, LeRoy C. 1962. Land use alternatives for dryland grain-livestock operators, south-central Montana. Mont. Agr. Expt. Sta. Bul. 570.  
Rude, LeRoy C. 1962. Land use alternatives for dryland grain-livestock operators, north-central Montana. Mont. Agr. Expt. Sta. Bul. 571.  
Rude, LeRoy C. 1962. Land use alternatives for dryland grain-livestock operators, northeastern Montana. Mont. Agr. Expt. Sta. Bul. 572.

F. Appraisal of Adjustments in Rice Areas

- Gerlow, Arthur. 1963. Water planting rice in southwest Louisiana. Louisiana Rural Economist, Vol. 25, No. 2.  
Grant, Warren R. and Mullins, Troy. 1963. What size rice-soybean farm? Arkansas Farm Research. Jan.-Feb. p. 5.  
Grant, Warren R. and Mullins, Troy. 1963. An economic appraisal of adjustments in southern rice producing areas. The Rice Journal. Annual Issue, p. 73.  
Grant, Warren R. and Mullins, Troy. 1963. Enterprise costs and returns on rice farms in the Grand Prairie, Arkansas. Ark. Agr. Expt. Sta., Report Series 119.  
Hall, Vernon, Bryan, Billy, Engler, Kyle, Grant, Warren R. and Mullins, Troy. 1963. Plastic levees in rice irrigation. Arkansas Farm Research. Jan.-Feb., p. 4.  
Mullins, Troy. 1963. Some production problems of importance to Arkansas rice growers. Paper presented to annual meeting of Arkansas Farm Bureau Federation.

G. Appraisal of Adjustments in Feed-Livestock Areas

- Boykin, C. C., Gray, J. R. and Caton, D. D. 1962. Range production adjustments to drought in eastern New Mexico. N. Mex. Agr. Expt. Sta. Bul. 470.  
Caton, D. D., et.al. 1962. Economic relationship of grazing fees and permitted use of public rangelands to net incomes of western livestock ranches: a regional analysis. Farm Prod. Econ. Div. Administrative Report.  
Caton, D. D., McCorkle, Jr., C. O., and McConnen, R. J. 1963. Feed-livestock relationships: a model for analyzing management decisions. Agricultural Economics Research, Vol. XV, No. 2.  
Finley, R. M. and Johnson, R. D. 1963. Changes in the cattle feeding industry in Nebraska. Nebr. Agr. Expt. Sta. Bul. 476.  
Heagler, Arthur M., Crowe, Grady B., and Cooke, Jr., Fred T. 1962. Miss. Agr. Expt. Sta. Bul. 649.  
Hunter, Elmer C. 1962. Economics of western cattle feeding. Livestock Credit Symposium. St. Louis, Missouri.  
Hunter, Elmer C. 1963. Changes in the cattle-feeding industry along the North and South Platte Rivers 1953-1959. ERS-98.  
Hunter, Elmer C. 1963. Figure your profit and loss. Feedlot, June 63.

- Wheeler, R. O. 1962. The range livestock industry in a dynamic inter-use environment. Proceedings, Western Farm Economics Association, Annual Meeting, Reno, Nev., Aug. 6-8, 1962.
- Wheeler, R. O. 1963. Costs and returns, Northern Great Plains, family operated cattle ranches. Montana Farmer-Stockman.

H. Appraisal of Agricultural Policies and Programs

- Aines, R. O. 1963. Release of land from conservation reserve contracts. AER-34.
- App, James L. and Sundquist, W. B. 1963. The feed grain program in Minnesota. Minnesota Farm Business Notes. Jan. 1963.
- App, James L. and Sundquist, W. B. 1963. The feed grain program in Minnesota, who participated, farmers' attitudes, adjustments in farm operations, future expectations. Minn. Agr. Expt. Sta. Bul. 464.
- Christensen, R. P. and Aines, R. O. 1962. Economic effects of acreage control programs in the 1950's. AER-18.
- U. S. Department of Agriculture. 1963. Wheat, the program for 1964, an economic analysis. U. S. Dept. Agr.
- Vermeer, J. 1963. An economic appraisal of the 1961 feed grain program. AER-38.
- Whittlesey, N. K., McKee, D. E., and Heady, E. O. 1963. The 1961 feed-grain program -- who took part? Iowa Farm Science, Vol. 17, No. 8, pp. 11-14.
- Whittlesey, N. K., McKee, D. E., and Venezian, E. 1963. The 1961 feed grain program -- what effects on farms? Iowa Farm Science, Vol. 17, No. 9, pp. 20-22.
- Whittlesey, N. K. and McKee, D. E. 1963. The 1961 feed grain program -- what did farmers think of it? Iowa Farm Science, Vol. 17, No. 10, pp. 18-20.

## AREA NO. 2. ECONOMICS OF FARM MANAGEMENT AND CONSERVATION PRACTICES

Problem. There are marked differences among the major agricultural areas in the physical and economic environment which determine the possibilities and limitations on successful operation of farms. More information is needed for each type of farming region on the patterns of production resources and systems of farming used by individual farmers; the production requirements and output obtained from various enterprises with different methods of operation, including especially those practices that aid in soil and water conservation; the relationships between size of operations, combination of enterprises, production practices used, efficiency in production, and farm financial returns; and alternative opportunities for desirable adjustments, particularly those which conserve soil and water, on farms of different sizes, types, and physical conditions.

### USDA PROGRAM

A continuing long-term program of research dealing with the economics of farm management practices is conducted in cooperation with 12 State experiment stations. In the northeast region, emphasis is on input-output relationships for dairy forage and poultry. In the corn belt, research emphasizes hog production and corn harvesting. In the southern region, emphasis is on cotton insect control, and in the western region attention is given to mechanization. Studies of the economics of conservation practices are emphasized in Wisconsin, Michigan, Missouri, and Texas. While major attention is given to determining input-output relationships, emphasis is also given to economic analysis within the framework of profitability to the farm firm.

A total of 9.7 Federal professional man-years was devoted to this area of research--4.7 man-years in economics of farm management; 4.5 in economics of conservation practices; and 0.5 in program leadership.

### REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

#### A. Economics of Farm Management Practices

Dairy, forage, and poultry. In New Hampshire a study of forage production and utilization has resulted in the writing of a computer program which will provide estimates of income associated with changes in forage harvesting systems, date of initial harvest, and seasonal weather patterns.

The market egg study in Connecticut has provided considerable time and motion study data on poultry chores. These data can be combined in various systems of operation with differing labor, equipment, and capital requirements. Interdependent production practices such as varying replacement procurement systems and dates of hatch can be appraised within a system.

A capital accumulation study of broiler growers conducted at New Hampshire has been completed. Based on this study, a family can manage and operate a production unit of up to 35,000-broiler flock capacity. The present technology used during the brooding period acts as a restriction to larger capacity units for family operations. Units of 10,000 and 20,000-broiler flocks do not have sufficient accumulation potential to replace the physical plant when operated as full-time occupations, under the price relationships tested. Larger capacity units of 35,000 and 50,000-broiler capacities would have sufficient capital accumulation potentials and provide a satisfactory living for growers on the basis of a full-time family operation.

Records from 164 farmers in southeastern Minnesota and 127 from southwestern Minnesota were summarized. Analyses indicated that investment and annual cost per acre of crops produced is lower for the large farms. The annual crop costs ranged from an average of \$18.80 per acre for farms of 141 to 180 acres, to \$12.20 per acre for larger farms of 401 to 500 acres.

Hog production and corn harvest. Alternative systems of hog production are being studied at Illinois. The chief problem encountered in confinement feeding is the difficulty and cost of manure disposal. During the year, two developments were followed closely on research and commercial farms. First, slotted floors in both the farrowing and finishing quarters result in virtual elimination of the cleaning chore, an activity that was taking an average of three-fourths of the total labor used in the growing-finishing phase. All new facilities should incorporate the slotted-floor feature, and it can be successfully added to many existing buildings. Second, reports are mounting to the effect that aerobic-type manure lagoons are not working as anticipated. Sediment buildup is rapid and odors are quite objectionable. Surface area requirements are going to be too great to permit general acceptance of aerobic-type lagoons. Work on the engineering phase will likely point toward development of specific requirements for aerobic-type lagoons or septic systems. Hauling and spreading of liquid manure will likely increase if for no other reason than easing the odor problem.

Also at Illinois, alternative methods of corn harvesting are being analyzed. Most of the factors affecting the choice of a harvesting method relate directly or indirectly to costs. Some of the important factors include volume to be harvested, existing machinery and structures, field losses, available labor and capital, land use, and ultimate use of the grain.

Early harvesting reduces harvesting costs because field losses are smaller and working conditions are better than. Harvesting methods should be compared by the average field losses for the season, not the extremes that occur during late-season harvesting. In reducing harvesting losses, the combine has an advantage over the picker-and-sheller of about 0.8 to 1.0 percentage points of gross yield at 4,400 bushels, and 1.1 to 1.6 percentage points at 22,000 bushels. Field losses are least for field shelling with a



combine and storing as high-moisture corn--2.6 to 3.7 percent for volumes of 4,400 to 22,000 bushels. In contrast, field losses are greatest for conventional ear-corn harvesting and crib-storage--5.9 to 9.4 percent for volumes of 4,400 to 22,000 bushels.

Field shelling is more economical in both labor and machinery than picking and then shelling with a stationary sheller either in the field or at the crib. In field shelling, one man, one machine, and one power unit do the work of two machines, two power units, and three or more men required for picking and then shelling.

Mechanical drying is a replacement for drying by natural means. It is an added cost of field shelling and storing except when the corn is stored at high moisture. The more rapidly corn is dried, the more it costs in initial investment and operating costs for drying and sometimes in quality of corn.

Storage for dry shelled corn costs less than half as much as new ear corn storage. Structures for high-moisture shelled corn cost more per bushel than those for dry corn because of the need to provide essentially air-tight conditions and the extra space required for the high-moisture grain. On a dry matter basis, cost per bushel of capacity is about  $1\frac{1}{2}$  times as much for high-moisture ground ear corn as for high-moisture shelled corn.

The choice of field-shelling equipment is determined at volumes of 8,000 to 11,000 bushels. The picker-and-sheller is most economical to use for smaller volumes, and the combine with corn-head attachment for larger volumes. This relationship is true when two-thirds of the cost of the combine is allocated to corn harvesting.

Harvesting and storing high-moisture shelled or ground ear corn is the least costly method for cattle feeders, particularly if new storage structures are needed.

Supplemental heat drying is more economical than portable batch drying for volumes below 22,000 bushels when all new harvesting equipment and storage structures are assumed. A portable-batch drying method is most suitable for the farmer who has a large volume to dry, needs to dry fast, and requires the advantage of mobile, flexible equipment. Costs of portable batch drying are less than ear-corn harvesting and crib storage at volumes larger than 10,000 bushels.

Additional methods of handling corn, such as batch-bin drying and portable-batch drying with ear-corn cribs converted to shelled corn storage, can be considered if there is a crib on the farm that is sound and adequate for ear-corn storage or conversion to shelled corn storage. If ear-corn cribs are available for half of the total corn production, batch-bin drying costs the least at all volumes. Portable-batch drying costs less than storing ear corn in a crib at volumes greater than 13,000 bushels.

Cotton practices. During the summer of 1962, the Division conducted a survey among cotton farmers to obtain information pertaining to insect control and related practices in producing cotton. About 150 farmers in each of 14 geographic areas where the boll weevil causes considerable damage were interviewed. Detailed information was obtained as to whether or not insect control practices were used and if so, the acres covered, the kind, quantity, type, rate of application and cost of insecticides used and method of application. Similar information was obtained for pre-emergence and post-emergence herbicides, defoliants and fertilizer. Most of the data have been summarized and a report is being prepared.

Results of the study indicate that in 1961 about 80 percent of the total cotton acreage in the survey areas was treated with insecticides at an average cost of about \$8 for materials and \$5 for application, or a total of \$13 per acre treated. Estimates are available on proportion of acreage treated with different types of insecticides and method of application by size of farm, by areas. Airplanes were used on about 22 percent of the "once over equivalent acreage."

Pre-emergence herbicides were used on about 35 percent of the cotton acreage in the survey. This ranged from none in several of the Texas areas to 77 percent on large farms in the Louisiana Delta. The average cost per acre treated was about \$3. Similar summary data are available for fertilizer, post-emergence herbicides and defoliants. Thus a rather complete picture of the use of chemicals in cotton production is available for these areas.

In a study of the economics of mechanization of Mississippi cotton farms, attention has been given to the effect of cotton yields on mechanical cotton picker efficiency. Preliminary analysis indicates that efficiency increased an average of .56 percent per hundred pounds of increase in yield of seed cotton within the range of 900 to 3,000 pounds. Economic evaluations are also being made of "cotton gleaners," machines designed to salvage cotton left in the field by conventional harvesting processes. Preliminary results indicate that a recovery of 28 to 30 pounds of lint cotton per acre would be needed for the gleaner to be economic, assuming average operating conditions.

An economic analysis of skip-row planting of cotton in the Yazoo-Mississippi Delta was initiated during the year. Skip-row planting of cotton is being used because of expected yield increases per allotted acre. The purpose of this study is to appraise the effect of this practice on cotton yields and production practices, and on the organization of representative farms.

Mechanization. In Kansas and Colorado, data on inventories, investments and expenses on tractors and machinery obtained in a survey of representative wheat farms were summarized and analyzed. It was observed that a higher percentage of machines on the smaller farms were purchased second hand than on the larger farms. Expenses per hour used of tractors purchased second hand averaged 65 percent as high as for tractors purchased new. But the tractors purchased second-hand were only used two-thirds as many hours in 1960.

About 10 percent of the machines on survey farms in 1960 were idle, some because they were purchased too late for use that year, and some because they were kept on a stand-by, "if needed" basis. Large farms with new machinery produce wheat with less labor and lower machinery costs per crop acre than do medium sized farms with used machinery. Labor requirements and machinery service costs per acre are still higher on the smaller farms.

Publications are planned to report the data separately for Kansas and for Colorado. These reports will summarize and analyze the cost data for use in the two States. A third publication is planned which will present the survey data in detail for two sub-areas in Colorado and two in Kansas, and which will relate the data to the sizes and kinds of farms having the machines. The data are also being used to improve input data for budgeting and linear programming work on adjustments in wheat farming and other studies.

The cost of operating tillage and harvesting machinery in Nebraska was studied on 118 farms and the results published. A second report on the cost of operating tractors in Nebraska has been approved for publication.

Yield variability. A study of variability in wheat yields in Montana was completed and published. Applying extreme value statistical distribution theory to individual farm yield data, and given the yields necessary to cover cash-costs plus depreciation, and so on, it was found that the small farmer with a history of poor yields has a better chance (probability) of paying his cash-costs than does a large farmer also having a history of poor yields. This may help explain why small farmers on poor land or with poor managerial ability seem to survive when their neighbors on larger farms go under. But it may also explain the difficulty many small wheat farmers have in keeping up with the trend to obtain larger operating units--they survive but don't get ahead. As is to be expected, a small farmer with a high yield history has a lower probability of getting reinvestible surpluses than does a farmer on a larger farm with a similar yield history. Another finding was that farms of the same size but with parts dispersed geographically have more stable farm average wheat yields than farms having all land contiguous. The dispersed farm has more chance that some fields will receive a needed rain in a drought year, and less chance that all the fields will be "hailed out."

In an economic appraisal of alternative systems of farming and ranching in the Great Plains area of Oklahoma, emphasis has been placed on analyses of business survival opportunities, through time, of farms of different sizes and types. Five representative size-types of farm with different equity and tenure situations are being considered in the analysis. Farm budgets have been prepared representing each year during a 16-year period 1942-57. Accumulated operating and capital credit needs have been determined. This step is completed for most of the assumed situations. The next step is to determine the survival possibilities of the more important systems under several runs of good and bad years.



Range. Work was continued on the costs and returns relationships of selected range improvement practices in California, Arizona and New Mexico. Included were such practices as forage reseeding, brush control, fertilization, controlled grazing, fencing and water development. In addition to the reports published, manuscripts are in process on costs, methods and possible economic benefits from range improvement practices in California and in New Mexico.

#### B. Economics of Conservation Practices.

The study on cropping systems on dryland farms in the Southern High Plains is being revised and expanded to show the extreme variations in production, costs, and returns that occurred under various cropping systems from 1943 to 1956 at the Bushland, Texas, Experimental Field. These systems are being budgeted under present costs and prices and with projected future rather than past yields.

The study on use of fertilizer, irrigation water, and land use on irrigated farms in northeastern Colorado has been completed. A manuscript is in press. This report will serve as a bench mark for appraising future use of agricultural resources in the area and will provide input data for further research.

The study on response of irrigated alfalfa to phosphate fertilizer in northeastern Colorado has been completed and a manuscript approved for publication. Results indicate that a relatively high rate of application of phosphate fertilizer is profitable under present cost-price relationships when other cultural practices including irrigation are carried out. Results were presented in a paper given at the Annual Fertilizer Conference in Colorado.

In Michigan, land drainage survey data for 90 farms and covering a 3-year period were analyzed to provide estimates of productivity changes resulting from recommended improvements in field drainage. Records were analyzed from three soil types (Pickford, Parkhill-Capac, Silverwood-Rose Elm) all of which are considered to be drainage problem soils. Improved drainage increased the yield of dry beans by an average of 27 percent, wheat 20 percent, oats 14 percent, alfalfa 12 percent, and dry corn 11 percent. More than half of the survey farms had inadequate outlets for draining their farmland. Only 30 percent of the cropland was currently being drained in these 3 soil areas. Analysis is currently being made of the survey data from 200 farmers obtained in the spring and summer of 1963. These data will be used to assess the potential impact on land productivity and farm income of recommended land drainage practices on an area-wide basis. An Extension bulletin is in press which outlines the important features of the Michigan Drain Code and common law concerning drainage. This report provides a nontechnical description of the procedure required for organizing to provide public drains, and the legal determinations associated with implementation of land drainage generally. The report is intended to aid in implementing drainage improvements determined to be profitable.



A characterization of the drought-hazard for an agriculturally important four-county area in southeastern Missouri was completed. A manuscript, "Occurrence of Drought in Southeastern Missouri," has been cleared for publication. The results of this study were used as a guide in planning field experiments currently underway. The results will also be useful to farmers in determining the drought-hazard which they face on various soil types, and in selecting irrigation systems to provide protection against drought-hazards.

A study of adjustments in irrigated crop production in the Upper Texas Panhandle was completed. Results of the study, which have been published, indicate that the direct expenses associated with the production of irrigated wheat and grain sorghum are six times the direct expense under non-irrigated conditions, and that average or above yields under irrigation, particularly for wheat, will be required to break even in situations where L.P. gas is used for fuel, or well yields are below 450 gallons per minute, or where the investment in irrigation facilities exceeds \$100 per acre irrigated. Analyses of the effect of variations in fuel costs, well yields, and water use on costs and returns are presented in the report.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Economics of Farm Management Practices

- Bostwick, Don. 1962. Yield probabilities as a Markov process. Agr. Econ. Res. Vol. XIV, No. 2.
- Bostwick, Don. 1963. Studies in yield variability. Mont. Agr. Expt. Sta. Bul. 574.
- Burbee, Clark R. and Frick, George E. 1962. Capital accumulation potential of broiler growers. New Hampshire Agr. Expt. Sta. Bul. 475.
- Clayton, Joe E., Shaw, C. Scott and Lindsey, M. M. 1963. Recovery of field-loss cotton-field practices, costs, and ginning in the Mississippi Delta. Paper No. 63-128, Annual Meeting, American Society of Agricultural Engineers, Miami Beach, Fla.
- Cotner, M. L. 1963. Controlling pinyon-juniper on southwestern range-lands. Ariz. Agr. Expt. Sta. Rpt. 210.
- Dailey, R. T. 1963. Planning your machinery investment. The National Future Farmer, April.
- Davis, V. W. and Andrew, F. W. 1962. Moisture wise and dollar wise. Dept. of Agr. Econ., Univ. of Ill. FMFO No. 260.
- Davis, V. W. and Andrew, F. W. 1962. How to determine moisture in grain. Dept. of Agr. Econ., Univ. of Ill. FMFO No. 261.
- Davis, V. W. 1962. Effect of on-farm drying on storage and quality of grain. Dept. of Agr. Econ., Univ. of Ill. AE 3828.
- Davis, V. W. 1963. Economic considerations in choosing a corn harvesting method. Dept. of Agr. Econ., Univ. of Ill. AERR-63.
- Giannini Foundation. 1962. Economic analysis of range improvement: A guide to western ranchers. Calif. Agr. Expt. Sta. Rpt. No. 255.
- Lindsey, M. M. 1963. An economic analysis of custom work on farms in the Yazoo-Mississippi Delta. Miss. Agr. Expt. Sta. Bul. 667.
- Parker, R. E., Clayton, J. E. and Lindsey, M. M. 1963. Efficiency of picker related to cotton yield. Mississippi Farm Research, Vol. 26, No. 8, State College, Miss., August.
- Strickland, P. L. and Turner, Charles C. 1963. Cotton insect control and related production practices, Limestone Valley area of Alabama. Agr. Econ. Mimeo. Dept. of Agr. Econ., Auburn Univ., Auburn, Ala.
- Thorfinnson, T. S. and Epp, A. W. 1963. Cost of operating tillage and harvesting machinery in Nebraska. Nebr. Agr. Expt. Sta. Bul. 475.
- Voelker, S. W. and Nordbo, M. T. 1962. Statistics on fertilizer consumption in North Dakota. N. Dak. Agr. Expt. Sta. Agr. Econ. Rpt. No. 25.

B. Economics of Conservation Practices

- Anderson, J. C., Heady, E. O., and Shrader, W. D. 1963. Profit maximizing plans for soil conserving farming in the Spring Valley Creek Watershed in southwest Iowa. Iowa Agr. Expt. Sta. Bul. 519.
- Cooke, Fred T., Jr. 1963. The economics of supplemental irrigation in cotton, Yazoo-Mississippi Delta. Miss. Agr. Expt. Sta. Bul. 669.

- Cotner, Melvin L. 1962. Criteria and problems in the use of quantitative analytical procedures for public development investments. *Journal of Farm Economics*, Vol. XLIV, No. 4, pp. 1085-1092.
- Cotner, Melvin L. and Kelso, M. M. 1963. Northern Arizona beef production is affected by pinyon-juniper. *Progressive Agriculture in Arizona*, Vol. XV, No. 2.
- Landgren, N. E., Timmons, J. F. and Anderson, J. C. 1963. Watershed protection through farm planning. *Journal of Soil and Water Conservation*, Vol. 18, No. 1.

### AREA NO. 3. STRUCTURE OF AGRICULTURE AND ECONOMICS OF FARM SIZE

Problem. In keeping with rapid rates of farm technological advance since World War II, American agriculture is being rapidly reorganized into an increasingly smaller total number of larger farms. For example, during the 1939-1959 period the total number of commercial farms declined 41 percent--from 4.1 million to 2.4 million. But this smaller number of farms produced 92 percent more total output--\$29.5 billion as compared with \$15.4 billion worth of sales (1959 dollars). Average marketings per farm increased more than 227 percent--from \$3,700 to \$12,200. This radical change in the structure of American agriculture generates fundamental problems on which understanding and quantitative information are needed by farm policy makers, farm leaders, farm people, and the public at large.

#### USDA PROGRAM

New forms of vertical coordination have brought significant changes in the structure of American agriculture in recent years. Emphasis is given to basic analysis designed to describe existing kinds of vertical coordination, appraise their characteristics, and suggest lines of needed research. Applied projects in other research areas also examine vertical integration, contracting, and alternative means of coordination for specific commodities.

Changes in the number, size, and characteristics of the farm businesses in which American agriculture is organized are continually measured and interpreted. In analyzing these changes, special attention is given to the relative position of various size groups of farms, including family and larger-than-family farms. These relative positions are being developed in terms of total farm marketings, net farm income and farm investment, use of hired labor, age, and tenure of operators. Examination is being made of important beliefs and values that are affecting the implementation of economically feasible adjustments in agriculture.

Analysis is being made of the complements of resources needed to enable farm operators to have specified levels of annual earnings for their labor and management. The levels selected for study are \$2,500, \$3,500, \$4,500 and \$5,500. Resource requirements for these income levels are being estimated for 18 types of farm systems in 34 farm areas widely distributed throughout the United States.

Work on resource requirements for given income levels is being expanded to study the adjustments that will occur in the size and organization of American farms, given the economic and institutional forces that are likely to exist in the foreseeable future. This question is being handled in three parts. Part I determines what sizes and organizations of farm are economically optimum, according to a cost-efficiency criterion. Part II ascertains



the present position of actual farms relative to the optimum situations. Part III bridges the gap between actual and optimum, indicating economic adjustments that are attainable. This analysis will be carried on primarily at the farm level. The development of the farm over time will be approached in a framework of polyperiod analysis so as to facilitate consideration of the farm's initial size and equity position as well as problems of credit availability. Up to now, work on this study has been limited to Part I. This cooperative work is well underway in four States, and is being started in two other States. It is intended that as work is completed in the States where it is now underway, research resources will be used to extend the study to other States and types of farming. Work is underway in Texas, Colorado, Illinois and California, on five types of farms--cotton, beef feedlots, corn, hogs, and vegetables. Work is being initiated in Washington and Minnesota for wheat and dairy farms. It is proposed to conduct similar studies in 17 additional States for 12 types of farms.

Finally, a line of work is being conducted on resources used in farming as related to agricultural production and farm income, by geographic region and size of farm. The central objective is to determine and compare the earnings of land, labor, and capital on farms of the same size in different regions and on farms of different sizes in the same regions. The analysis spans a period of 11 years, making use of census data for 1949, 1954, and 1959. The study deals with all farms in 10 selected regions and in the United States as a whole. The regions are located in the Southern Appalachians, Southeastern Piedmont, Central South, Northern Lake States, Central Corn Belt, Southern Corn Belt, and the Missouri-Arkansas hilly area. The work on this study is being carried out in Washington, D.C. in cooperation with Iowa State University.

A total of approximately 11.8 Federal professional man-years is being devoted to this research area: Vertical integration, 1.2 man-years; economics of farm size and numbers of farms, 9.4 man-years; and program leadership, 1.2 man-years.

## REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

### A. Vertical Coordination

Basic analysis of vertical coordination was summarized in a bulletin published in February 1963. This report outlines the scope of the field, brings together the appropriate economic theory, and provides a general frame of reference for understanding the various kinds of vertical coordination.

A special computer simulation study was initiated to evaluate institutional changes in the vertical coordination of a sector of an agricultural industry. The computer simulation technique will seek to apply the basic theory developed in the earlier phases of the study to a realistic life situation. It will test the conditions under which shifts between kinds of coordination are

likely to occur. A milkshed in the Northeast will be selected as the sector for analysis.

A manuscript on contract production of truck crops is under review for publication. The analysis was based on data from a field study in 12 representative vegetable areas made mainly for the purpose of studying labor and materials used in truck crop production. The extent of contracting and other forms of coordination are described for principal vegetable crops.

An analysis of farmers' reactions to contract situations under different backgrounds of experience is reported in a paper "Tracing Farmers' Reactions to Uncertainty," published in the August 1963 Journal of Farm Economics. It is shown that communication problems in conducting such inquiries are related to farmers' experience with contracts (or lack of it).

An updated list of selected references on contract farming and vertical integration was prepared in cooperation with, and published by, the National Agricultural Library.

#### B. Economics of Farm Size and Numbers of Farms

The main findings on the relative position of family and larger-than-family farms for the period 1944-1954, which were published in Agriculture Economic Report No. 4, January 1962, were brought up to date for 1959. The report shows that 41 percent fewer commercial farms in 1959 than in 1939 produced 92 percent more farm marketings. Output per farm increased from \$3,730 to \$12,200, a 227 percent increase. There was a concentration of production in all size groups of farms with \$10,000 or more of marketings. The expansion progressed most swiftly on farms with \$40,000 or more of marketings. In all these size groups, the expansion is due more to increases in numbers of farms than to increasing sales per farm. For example, the number of farms with \$100,000 or more of sales increased from 5,000 in 1939 to 20,000 in 1959--an increase of 300 percent. Their average sales increased from \$226,000 to \$250,000--a 10 percent increase. The same principle applies to all other size groups of farms with \$40,000 or more of sales. The greatest degree of concentration was on family farms and not on larger-than-family farms. Family farms accounted for more than 70 percent of all farm marketings in 1959 as compared with about 66 percent in 1944.

The budgeting phase of the work on resource requirements for specified income levels has been completed. These data are being analyzed for use in preparing a summary report. The results will be useful in giving a clearer idea of the volume of farm sales and investments associated with given levels of income. For example, a corn farm in east central Illinois requires more than \$99,000 of capital investment and more than \$17,000 of gross sales to yield \$3,500 in returns for operator labor and management. This achievement assumes approximately 1959 price/cost conditions and the best available farm practices. In 1959, only a little more than one-fifth of similar type farms in the State had an equal or greater amount of gross sales than required on the

budgeted farm for this level of earnings. Findings for 16 types of farms in 29 widely scattered areas show that gross sales averaged \$13,948, \$17,199, \$21,377 and \$25,502 respectively for operator earnings of \$2,500, \$3,500, \$4,500 and \$5,500. Average investment on the budgeted farms averaged \$53,420, \$66,325, \$82,192, and \$96,710, respectively, for the four income levels. The range in investment was even greater than for sales--from \$23,467 to \$280,422.

Work on the study of economically optimum sizes and organizations of farms has not yet reached the findings stage.

The analysis of comparative earnings of land, labor, and capital on farms of the same size in different regions and of different sizes in the same region is nearing completion. The report shows, for example, that in 1959 net income to farm operators on Economic Class II farms averaged \$1,650 in the Central Corn Belt, and \$1,380 in the Southern Appalachians. Returns to all labor, after paying all other costs, ranged from nothing on Class VI farms to approximately hired labor wages or better on the larger farms. The rate of residual return on total capital investment varied more widely between large and small farms in the southern regions than it did in the Corn Belt.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Vertical Coordination

- Davidson, J. R. and Mighell, R. L. 1963. Tracing farmers' reactions to uncertainty. Jour. Farm Econ. 45(3), pp. 577-586.
- Davidson, J. R. 1962. Changes in coordination of cattle feeding. In Proceedings, Western Farm Economics Association, Annual Meeting, August 6-8, Reno, Nevada. (Processed)
- Larson, Nellie G. 1963. Contract farming and vertical integration, 1953-1962. National Agricultural Library List No. 64. Revised.
- Mighell, R. L. and Jones, L. A. 1963. Vertical coordination in agriculture. Agr. Econ. Rpt. No. 19.
- Mighell, R. L. 1963. Vertical coordination in agriculture. The Farm Cost Situation. May 1963. pp. 33-36.

B. Economics of Farm Size and Numbers of Farms

- Lanham, W. J. 1963. Resources required for specified levels of income farms, Upper Coastal Plain, South Carolina. Dept. Agr. Econ., S. C. Agr. Expt. Sta., A.E. 242, July.
- Nikolitch, R. 1962. Family labor and technological advance in farming. Jour. Farm Econ. 44(4), pp. 1061-1068.



#### AREA NO. 4. FARM CAPITAL, CREDIT, AND FINANCIAL CONDITION

Problem. Farm capital and credit requirements, and the financial condition of farmers, are changing continuously. The changes result from the explosive effects of new technologies in agriculture, from the increasing integration of agriculture and other industries including contracts for production, and from changes in farm prices, income, land values, and types and sizes of farms. Continuous study is needed to keep abreast of the changing capital requirements for various tenures, types and classes of farms, and to determine how farmers accumulate the capital needed for their operations and whether credit institutions are providing adequately for farmers' changing credit needs. Better tools need to be developed for measuring the effects of the changes in agriculture and in farm capital and credit requirements on farmers' assets, debts, and equities. Studies are needed for the guidance of farmers and credit institutions and to aid policymakers and program administrators in appraising the effects of farm programs.

#### USDA PROGRAM

The work in this area comprises a long term program of statistical and economic research in three principal areas: The balance sheet of agriculture and financial outlook; improvement of farm mortgage credit facilities; and short term credit and financial management.

In Washington, D. C., the work on the balance sheet of agriculture and financial outlook involves chiefly the assembly and analysis of data on farm assets, debts, and incomes and on factors affecting the financial situation of farmers. The Division has become a clearing house for data on farm debts, to which the major lenders (or their supervisory authorities) report on their own loans to farmers and look for comprehensive information on the entire farm debt situation. In addition the Division assembles data collected elsewhere in the Department and by some other agencies on farm assets and incomes and issues each year two analytical reports: (1) "The Balance Sheet of Agriculture," which measures and explains changes during the last year in the financial situation of agriculture; and (2) the "Agricultural Finance Outlook," which projects current trends and estimates what the farm financial situation will be during the next year. These publications contain the only available comprehensive analyses of the farm financial situation.

As an aid in preparing the Agricultural Finance Outlook, surveys are made each fall to determine the views of farmers, credit institutions, merchants, and dealers concerning the current farm financial situation and prospects for the coming year.

In the work on improvement of farm-mortgage credit facilities in Washington, D. C., data from all available sources are assembled and consolidated to determine the amount and distribution of the farm-mortgage

debt, the terms on which farm-mortgage credit is available from the principal lenders, the current volume of loans and repayments, and the extent of farm-mortgage debt delinquencies and foreclosures. Quarterly reports on the mortgage lending activities of the major life insurance companies and federally-sponsored agencies are obtained and analyzed. At 5-year intervals, immediately following the Census of Agriculture, cooperative surveys with the Census are made to determine the amount of farm mortgage debt held by nonreporting lenders, and the distribution of all mortgage debt among the various types, sizes, and economic classes of farms. The data from this activity are used in computing parity prices for agricultural products and in preparing the Balance Sheet of Agriculture, the Farm Cost Situation, and the Farm Income Situation; they also are used regularly by the National Agricultural Credit Committee, which meets three times each year to appraise the farm-mortgage situation. Numerous requests for data on the farm-mortgage situation are received each year from legislators, farm organizations, farm journals, the State agricultural experiment stations, and others.

In Columbia, Missouri, cooperative studies with the Missouri Agricultural Experiment Station are being made to determine the factors affecting the availability, cost, and other terms of credit for rural housing.

In the research on short-term credit and financial management, statistical work in Washington, D. C. is similar to that done on farm-mortgage credit, that is, serving as an assembly point and clearing house for information on the non-real-estate credit used in agriculture. The data from this part of the work have uses similar to those for the data on mortgage credit, except that they are not used in computing parity prices of agricultural products. These data are in wide demand. A major project currently underway is the analysis of data from a survey, cooperative with the Census Bureau, of all farm debt of operators and landlords, by type and economic class of farm.

Cooperative work with the agricultural experiment stations of the respective States includes the following: At Madison, Wisconsin, a study of the management services rendered by lending institutions in extending credit to farmers; at East Lansing, Michigan, studies of methods by which Michigan farmers accumulate the capital used in their operations and of the financing problems of large-scale farms; and, at Urbana, Illinois, a study of the financing of mechanized cattle feeding operations.

Federal professional man-years devoted to this work total 8.7 divided as follows: balance sheet of agriculture and financial outlook, 1.5 man-years; improvement of farm mortgage credit facilities, 3.8 man-years; short-term credit and financial management, 3.0 man-years; program leadership, 0.4 man-years.

These cooperative studies were terminated during the period: (1) A cooperative study with the Michigan Agricultural Experiment Station of the financial progress made by a sample of Michigan farmers, 1953-58, and of the relationship between their use of credit and their financial progress; and (2) a cooperative study with the Montana Agricultural Experiment

Station of factors affecting the cost and availability of rural housing credit in that State.

## REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

### A. The Balance Sheet of Agriculture and Financial Outlook

On January 1, 1963, farm assets were valued at \$216.5 billion, up \$8.5 billion from a year earlier. As in other recent years, most of the increase in 1962 came from the rise in farm real estate values. However, all other types of farm assets except U. S. savings bonds and household furnishings and equipment also were up. Farm debts rose sharply in 1962--to \$30.2 billion at year-end. Despite the increase of \$2.8 billion in farm debt, the equities of farm operators and other owners of farm assets continued to rise--from \$180.6 billion at the beginning to \$186.3 billion at the end of 1962. Net farm income realized by farm operators was only a shade higher in 1962 than in 1961--\$12.6 billion compared with \$12.5 billion.

In relation to their expenditures, the liquid financial assets owned by farmers are now much less than they were a decade ago. That may account for the increasing proportion of expenditures (including investments) for which farmers apparently are using credit. Despite rapidly increasing debts, a recent study indicates that only about 30 percent of the farm operators had mortgage debt at the end of 1960 and only a fourth of these (7 1/2 percent of all farm operators) had mortgage debts amounting to as much as 50 percent of the value of the farmland and buildings they owned.

### B. Improvement of Farm-Mortgage Credit Facilities

Outstanding farm mortgage debt rose \$1.5 billion or 10.6 percent during 1962, compared with \$1.0 billion in 1961. The dollar volume of farm mortgages recorded was 16 percent higher in 1962 than in 1961. Average size of the mortgages recorded was up 13 percent over 1961. The growth in loan size, which has been occurring over a long period, reflects the continuing employment of increased resources in individual farm operations and the rising prices of farm real estate.

The supply of funds available for mortgage lending expanded in 1962. A rapid growth of savings during the year increased demand for fixed-dollar investments of all kinds and reduced the yields of many types of securities, but life insurance companies were able to hold their interest rates on farm mortgage loans at an average of about 5.8 percent throughout the year, even though most of the Federal land banks were charging 5.5 percent on their loans.

Lenders were further encouraged to add to their holdings of farm mortgage loans by their favorable collection experience with these loans. In 1962 the percent of repayments (including refinanced loans) was 11 percent of beginning-of-the-year outstandings for life insurance company loans, 9



percent for Federal land bank loans, and 7 percent for loans of the Farmers Home Administration.

A sharp increase in direct mortgage loans held by the Farmers Home Administration was chiefly the result of an expansion of loans for rural housing. Loans for nonfarm rural housing were first authorized in the fall of 1961. Last year (1962) was the first full year during which such loans were made. Loans insured by the Farmers Home Administration and held by other lenders also increased rapidly during the year as the interest return on these loans was attractive to other lenders.

A report (cooperative with Census) on the 1961 survey of farm mortgage debt was published during the year. This report contains data not previously available on the distribution of mortgage loans by term, type of lien, and year when made.

Rapid progress was made during the year with the studies of rural housing credit. Preliminary reports have been prepared and are nearly ready for publication on: (1) a nationwide survey of the housing loan activities of commercial banks, mutual savings banks, savings and loan associations, and the larger life insurance companies; and (2) on cooperative studies with the State agricultural experiment stations of Missouri and Montana on the rates and terms of rural housing loans and factors affecting the cost and availability of rural housing loans in these States. Substantial progress has been made on a study of about 112,000 loan applications handled by the Housing and Home Finance Agency under its Voluntary Home Mortgage Credit Program.

These housing credit studies indicate that credit is not as readily available, or available on as good terms, for rural nonfarm housing as for urban housing or even for farm housing. Life insurance companies and mutual savings banks, through their loans in parts of the South and Plains States where local funds for housing credit are inadequate, have brought about a rough equality of housing loans relative to residential property values in all regions. But their loans have been largely FHA insured or VA guaranteed loans on urban properties. Local lenders in rural areas originate few loans of these types, hence nonfarm homeowners in rural areas have been dependent chiefly on local sources of credit and to a large extent on commercial banks. As a result, the terms of housing loans are considerably shorter, and required downpayments on homes are considerably larger, for rural nonfarm homes than for urban homes.

These differences are partly a consequence of the generally weaker markets for rural nonfarm homes--often explained by their isolation and lack of utilities--and partly a consequence of the small average size of loan required and the small volume of housing credit needs in many rural communities. But to no small extent they arise from imperfect functioning of the financial system. Facilities for financing farm homes are considerably better than those for financing houses in small towns and rural nonfarm homes. This is because of the greater access of farmowners to outside



sources of funds such as the insurance companies and Federal land banks. The Farmers Home Administration is providing a valuable service by making long-term, low-downpayment, loans available to both farm and rural nonfarm residents for the construction or improvement of rural housing.

Farm debt data from the 1960 Census sample survey of agriculture are being analyzed to determine the characteristics, and levels of indebtedness, of farmers who have obtained mortgage credit from the principal farm mortgage lenders. The Federal Reserve Board, Federal Reserve banks, Farm Credit Administration, and the Farm Production Economics Division are cooperating in this work. Their studies are giving a better picture of the various parts of the farm mortgage credit market and of the types of farm mortgage credit needs served by various lenders than has been available. A preliminary report on borrowers from the Federal land banks and life insurance companies has been prepared, and analytical work for several other reports is in progress.

### C. Short-Term Credit and Financial Management

Non-real-estate farm debt (excluding CCC loans) increased more than \$1 billion or 9 percent during 1962. The dollar increase was one-half larger than in 1961 and approximately equal to the sharp increases of 1958 and 1959. Following the large increases of these years, non-real-estate farm debt rose only \$400 million in 1960 but it has risen at an increasing rate since then.

The average size of non-real-estate farm debt rose further in 1962. At mid-1962, outstanding loans of individual PCA borrowers averaged 10 percent larger than a year earlier: those of FHA borrowers were 15 percent larger. Over the years individual credit requirements have grown with increases in the size of farms and in the capital needed to operate them. Requirements in 1962 were especially large because of the increased number of cattle on feed.

The condition of non-real-estate loans appears to have continued generally strong in 1962. Loan renewals were equal to about 28 percent of total loans made by the PCA's in 1962--about the same as in 1960 and 1961. A year-end survey by the American Bankers Association indicated that repayments of bank-held non-real-estate farm loans continued to be large in 1962 although there was a slight increase in delinquencies during the last half of the year.

Interest rates charged on non-real-estate farm loans changed little from 1961 to 1962. Including service charges, rates charged by the PCA's declined slightly but those charged by banks appear to have risen slightly.

Cooperative work with the Michigan Agricultural Experiment Station produced several bulletins and other publications last year. More reports are in process; one is nearly ready for publication. The published materials (listed later and partly described in last year's report) deal with credit

use and financial progress on Michigan farms, the specific uses and services of the credit they obtained, and the extent to which they used credit from various sources in purchasing land. Basic data for these reports were obtained from participants in the Michigan Farm Credit Panel. From the time they started farming through 1959, 87 percent of the farmers in this panel bought land and, of those, 89 percent used credit in making their purchases. Individuals--often the sellers of the land--were by far the principal source of credit they used.

Another report, analyzing the seasonal cash flows of the panel members and showing how credit is used to meet seasonal income deficits, is nearly ready for publication. Three additional reports are in process. One will show how the panel members accumulated the capital they had in 1960. The others will deal respectively with credit-financed farm adjustments and the credit used by panel members in making land improvements.

The proposed study of financing large-scale farming operations in Michigan, mentioned in last year's report, has been delayed pending completion of other work but will soon be initiated.

In Wisconsin, two cooperative reports on the financing of Wisconsin farmers have been prepared and are nearly ready for publication. One report is concerned mainly with the types of farmers financed by production credit associations and the extent to which the PCA's give management assistance to their borrowers. It was found that the PCA's, like the banks which had been studied earlier, gave little assistance on technical farm problems but frequently advised their borrowers on more general matters of financial management. The second report deals with borrowers of the Farmers Home Administration. It contains data on their income, expenditures, and debt payments and compares their efficiency with that of "typical" Grade A and commercial milk producers.

Farm debt data from the 1960 Census sample survey of agriculture are providing much new information about the non-real-estate debt situation of farmers as well as their mortgage debt situation. It provides the first information ever available on the total debt situations of major classes of farmers, and on the relation of their debts to the value of the land they own and the income they receive from farm and nonfarm sources.

Three reports based on these data have been published--one by the Bureau of the Census and two in the Federal Reserve Bulletin. Two additional reports by Reserve Bank economists are nearly ready for publication in the Federal Reserve Bulletin. A technical appraisal of data from the Census survey will soon be published by the Division, and Division personnel currently are preparing several other reports on the survey data.

The data from this survey also are being used as a basis for revising the Department's series on non-real-estate farm debt. The survey data indicate that for a decade or more the Department's estimates of non-real-estate debt to nonreporting lenders, such as merchants, dealers, finance companies, and individuals, have been too low by a substantial margin.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Balance Sheet of Agriculture and Finance Outlook

1963 Agricultural Finance Outlook. November 1962. ERS, AFO-2.

B. Improvement of Farm-Mortgage Credit Facilities

Cotner, M. L., Wirth, M. E., and Brake, J. R. 1963. Credit experience in purchasing land. Michigan Agr. Expt. Sta. Quarterly Bul. Vol. 45, No. 4.

Farm Mortgage Debt and Farm Taxes. 1962. Final Report--Vol. V.--Part 4--Special Reports, U. S. Census of Agriculture: 1959.

Farm Mortgage Debt. 1963. ERS, FMD-1.

Farm-Mortgage Lending Experience of Life Insurance Companies, the Federal Land Banks, and the Farmers Home Administration.

October 1962	ERS, FML-5
January 1963	ERS, FML-6
May 1963	ERS, FML-7
July 1963	ERS, FML-8

C. Short-Term Credit and Financial Management

Hamlin, E. T., Wirth, M. E., and Nielson, J. 1963. Financing agricultural production on Michigan farms. Michigan Agr. Expt. Sta. Bul. (Unnumbered)

Wirth, M. E., and Brake, J. R. 1963. Loans to farmers 1961. Michigan Agr. Expt. Sta. Quarterly Bul. Vol. 45, No. 3.

Wirth, M. E., and Brake, J. R. 1963. Interest rate calculator. Michigan Cooperative Extension Service Folder F-322.

Wirth, M. E. and Hamlin, E. T. 1963. Financial progress and use of credit on Michigan farms. Agricultural Finance Review, Vol. 24, pp. 18-25.



## AREA NO. 5. AGRICULTURAL RISKS AND INSURANCE

Problem. Risk bearing is a necessary and costly function of ownership and management in farming because of production hazards and price uncertainties. Expanded research in reducing agricultural risks should prove valuable to farmers in making management decisions, and to Government agencies and private insurance and financial institutions in adjusting their policies to meet farmers' needs.

Research in this field includes possible modifications of existing insurance, credit and taxation policies, which impose excessive burdens when farm incomes are low. It also includes study of alternative means by which farmers can (1) reduce risks by the adoption of new financial and production practices, (2) shift part of the risk to insurance, financial and Government institutions, or (3) most effectively combine these two approaches.

With rising farm-property valuations, more use of credit, inflation, and greater chance of personal injury, fatalities, and lawsuits (due to accidents arising from increased mechanization and more highway travel), more kinds and larger amounts of property, health and sickness, life, and liability insurance are required by today's farmers. There is considerable variation in premium costs among companies for identical coverages. The increased insurance coverages carried by farm operators require high premium outlays. Figures of from \$1,000 to \$1,500 are not uncommon. Priorities need to be established to aid farmers in allocating a given premium outlay according to need.

### USDA PROGRAM

A continuing program of applied economic and statistical research is carried on that involves the compilation of operating data for the farmers' mutual fire, windstorm and crop-hail insurance companies, and the analysis of problems and trends in such insurance (loss rates, expenses, proper safety-fund levels, reinsurance needs, etc.); evaluation of effects of OASDI on insurance programming and the retirement plans of farm operators, and on the tenure, number, size, organization, and management of farms; the development of farm-income distributions from OASDI data; and measurement of the causes and incidence of farm fire losses and farm accidents.

The work includes study of (1) the incidence of production risks, as reflected by yield variability and other factors, on the structure and functioning of farm units, and (2) various methods of risk bearing and financial measures that might provide guides for management decisions on feed and cash reserves, geographical dispersion of farming operations, flexibility of organization, depreciation and tax management, better planning, and insurance, from the standpoint of helping farmers improve the stability of their farm income and their prospects of survival during periods of drought, as well as their long-run capital accumulation, and also



to provide guides for the action programs of government, private insurance agencies, and financial institutions.

The work is done in Washington, D. C., with the informal cooperation of the Federal Crop Insurance Corporation, Bureau of Old Age, Survivors, and Disability Insurance, insurance trade associations, farmers' mutual companies, State insurance commissioners, State fire marshals, and in Montana, with the formal cooperation of the Montana Agricultural Experiment Station.

The program involves a total of 4 Federal professional man-years distributed as follows: Program leadership, 0.2 man-years; improvement of farmers' mutual fire, windstorm, and crop-hail insurance company operations, 0.2 man-years; organized farm fire protection and estimation of annual farm fire losses, 0.6 man-years; casualty and life insurance (including social security) and accident prevention for farmers, 1.5 man-years; and analysis of risks and risk-bearing in agricultural production, 1.5 man-years.

The research subareas or lines of work listed above are broad in scope. Certain segments of the work were completed and results published during the period under review; work on other segments was initiated.

#### REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

##### A. Improvement of Farmers' Mutual Fire, Windstorm, and Crop-Hail Insurance-Company Operations

An analysis was made of the operating experience of 226 sample farmers' mutual insurance companies during 1961 and 1962. Published as a separate and summarized in the Mutual Insurance Bulletin, the report indicated that fire losses increased in 1962 (from 13.9 cents per \$100 of insurance in 1961 to 14.8 cents in 1962), that operating expenses were slightly higher (7.7 compared with 7.5 cents), and that assessment rates also were slightly higher (28.6 compared with 28.1 cents per \$100). Windstorm loss payments were considerably less in 1962 than in 1961 (7.7 cents per \$100 of windstorm insurance in 1962 compared with 9.4 cents in 1961).

##### B. Organized Farm Fire Protection and Estimation of Annual Farm Fire Losses

Farm fire losses in the U. S. were estimated at \$175 million in 1962, compared with \$163 million for 1961. These estimates are based in part on the experience of the above-mentioned sample farmers' mutual insurance companies. More complete data, including the farm experience of stock companies and Census figures, are used in establishing the level of losses for benchmark years.

In connection with subcommittee work of the Rural Fire Protection Committee, National Fire Protection Association, a staff member prepared (1) a proposed model law on rural fire protection, and (2) a summary (for NFPA

Standard 192-D) of pertinent provisions of State laws dealing with rural fire protection districts and rural fire protection.

Upon request of the National Farm Fire Safety Seminar, a staff member made studies and prepared reports on (1) the Federal income-tax aspects of farm ponds and water reservoirs used for fire-fighting, and (2) the extent of lightning damage to farm property. It was estimated that lightning damage to or loss of farm property, including livestock, amounted to about \$33 million in 1961. Lightning therefore accounted for a fifth of the total farm fire (and lightning) losses for that year.

C. Casualty and Life Insurance (Including Social Security) and Accident Prevention for Farmers

A report was published in June covering (1) the liability involved when farmers operate recreational facilities, such as those sponsored under the Rural Areas Development Program, and (2) the type of insurance needed to provide financial protection against lawsuits arising from their use by fee-paying guests. As stated in the report, the casualty-insurance rating bureaus are studying the possibility of preparing and filing rate schedules and endorsements to their farmers comprehensive personal liability (FCPL) policies with the State insurance commissioners. Such filings would make it possible for member and subscribing companies to write liability insurance on recreational facilities as an adjunct to their FCPL policies at scheduled flat fees per activity. As of September 1, nearly 30,000 copies of the report had been printed, with additional printings expected because of the widespread demand.

In a study of farm accidents, it was found that accidents are not being reduced as fast in farming as in industry. Motor vehicles was listed as the agency of injury most frequently associated with accidents to farm people; farm machinery was the agency most frequently associated with accidents occurring on farmland; and falls were most frequently associated with home accidents. About two-thirds of the accidents to farm people occur on farms and one-third occur on highways and other places off farms. Loss-time injuries involve about 19 percent of the farm population annually.

Work is continuing on a study of the variability of self-employment incomes from farming over time to the same individuals, based on a random one-percent (work-history) sample of farm tax returns for social security coverage. Measures of the variability of farm income will be shown, by regions, for several levels of average income.

Relatively few individuals receiving above-average farm incomes also earn an appreciable amount of off-farm wages; but they are more likely to combine farming with operating a nonfarm business than are individuals with below-average farm incomes. By age, the younger farmers--under 40 or so--are more likely to earn off-farm wages. From about age 40 to retirement, nonfarm self-employment is more frequent. This study of farm incomes would be strengthened by an analysis of available farm-account records.

D. Analysis of Risks and Risk-Bearing in Agricultural Production

A long-standing problem in crop-insurance ratemaking, both here and abroad, has been how to use county or area yields by years to estimate probable losses under contracts that provide for payment when individual--not aggregate--yields fall below some level of coverage or guarantee. Annual yields per seeded acre for individual tracts over an extended period are scarce, whereas county yields for many crops are available for long periods. The yield histories for individual State-leased tracts in Montana provided the "grist" for a study of how to "bridge across" from county or area yields by years to coverages and rates applicable to individual farms. Related research, based on FCIC wheat insurance experience in 100 sample counties, also was included in the report. This report should be helpful to the FCIC in offering insurance on additional crops and on wheat in additional counties, and also to foreign countries in starting crop-insurance programs.

The yields for individual tracts, mentioned above, provide one of the few sources of such information over an extended period. Because of their utility in crop-insurance research, these data have been brought up to date and put on IBM cards. Computer programs are being used to explore (1) the relationship between levels of coverage and average annual loss costs per acre under various crop-insurance plans, and (2) rate-making procedures under several yield-distribution assumptions, as part of our contribution to a joint cooperative effort with the experiment stations in Colorado, Montana, Nebraska, North Dakota, and Oklahoma.

By request, a staff member worked with the Consumer Advisory Council and a staff employee of the Senate Banking and Currency Committee on salient provisions of a new Truth-in-Lending Bill (S. 750). An article on "Interest-Rate Disclosure Required by the Truth-in-Lending Bill," has been accepted for publication in The Accounting Review for October 1963.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Improvement of Farmers' Mutual Fire, Windstorm, and Crop-Hail Insurance Company Operations

None

B. Organized Farm Fire Protection and Estimation of Annual Farm Fire Losses

Botts, R. R. 1962. Federal income-tax aspects of farm pond or water reservoir (swimming pool) used for fire fighting. Dittoed.

Botts, R. R. 1962. Lightning damage to farm property. Dittoed.

C. Casualty and Life (including Social Security) and Accident Prevention for Farmers

Botts, R. R. 1963. If paying guests are injured . . . does your farm liability insurance cover it? Agr. Situation, 47(8), p. 11.

Rush, J. D. 1962. Farm accidents in the United States. Agr. Econ. Rpt. No. 17.

Rush, J. D. 1963. Farm accidents--a growing problem. Agr. Situation, 47(2), pp. 10-11.

Rush, J. D., and Botts, R. R. 1963. Liability and insurance protection for farmers who have income-producing recreational facilities. ERS-120.

Rush, J. D. 1963. Farm accidents in the United States. Ext. Serv. Review, 34(3), p. 56.

Rush, J. D. 1963. Current statistics on farm accidents in the United States. Mimeograph (unnumbered).

Rush, J. D. 1963. July 21-27 is national farm safety week. Agr. Situation, 47(7), p. 15.

D. Analysis of Risks and Risk-Bearing in Agricultural Production

Botts, R. R. 1963. A study of wheat yields on individual tracts in Montana's dryland wheat area, 1941-61, from the standpoint of crop-insurance ratemaking. Mimeograph (unnumbered).

Myrick, D. H. and Larson, D. K. A note on "Federal crop insurance tied to a bushel-quota farm program." Jour. Farm Econ. 45(3), pp. 665-666.



## AREA NO. 6. FARM TAXATION AND RURAL GOVERNMENT

Problem. Steadily growing requirements for schools, roads, and other governmental services are placing a severe strain on existing sources of State and local tax revenue. One result has been a more than doubling in farm real estate taxes since the close of World War II, with no evidence that the steep rise will slow in the foreseeable future. Research is needed on problems of financing governmental services in rural and suburban fringe areas, including consideration of the effects of taxation on agriculture, the role of the property tax in local finance, and possible alternative sources of revenue. The purpose of this research is to find ways to ease financial problems of rural governments and the tax burden on agriculture.

Problems of local finance stem partly from inappropriate forms of local governmental organization. In most States, the structure of local government in rural areas was established generations ago and has not been adapted to today's needs. Considerable experimentation is going on with new forms of governmental organization and new financial arrangements. Research is needed to analyze and evaluate this experience and make the findings available to other communities facing similar problems.

### USDA PROGRAM

This work includes maintenance and improvement of statistical series on the major taxes paid by farmers, and analysis of the effects of various taxes on agriculture. Attention is given to tax proposals, Federal, State or local, that appear to have important consequences for farmers or agriculture. Studies cover problems in assessment and taxation of farmland, especially in rural-urban fringe areas; the sources of revenue for rural governments; and local government structure and organization in sparsely settled areas and in rural areas around growing cities. This work involves the disciplines of economics, public finance, political science and public administration.

Cooperative work was carried on in 1962-63 in Washington, D. C. and in New York, Minnesota, Iowa, and Illinois. Research was also carried on by non-Federal personnel under cooperative agreements with Michigan, Florida, California, Nebraska, Louisiana, and Missouri. Work continued on a 3-year research contract, initiated in 1961 with the Bureau of Government Research of Indiana University, for a study of arrangements in selected States for cooperation between units of rural local governments.

This program involved a total of approximately 7.1 man years of Federal professional personnel in fiscal year 1963, distributed as follows: Program leadership, 0.2 man-years; estimates of amount and incidence of farm taxes, 2.3 man-years; assessment and methods of assessing farm property, 2.0 man-years; organization and financing of local government, 2.6 man-years.

During the past year, research was initiated on organization and financing of rural government in the North Central States, with headquarters at Minnesota. Research on alternative forms of local government in rural parts of metropolitan areas was completed in California, Louisiana, and Florida, and reports on findings are in various stages of completion. New work on this topic was begun in Texas. All these projects are being conducted by non-Federal personnel supported by USDA under cooperative agreements. Work terminated includes a cooperative study of farmland assessment policies in the rural-urban fringe of Maryland, and a cooperative study of taxes paid by and public services received by rural people in Nebraska.

## REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

### A. Estimates of the Amount and Incidence of Farm Taxes

Taxes levied on farm real estate in 1962 increased to \$1,398 million, or 5.4 percent over the amount levied in 1961. These levies, imposed mostly by local units of government, have increased for twenty consecutive years and are now more than three times the level at the close of World War II. In 1962, the average tax per acre was \$1.36, compared with \$1.29 in 1961 and \$0.44 in 1945.

Taxes per \$100 of full value increased to \$1.03 in 1962. This was up slightly from the \$1.02 per \$100 in 1961, and the highest since 1941.

The continued uptrend in farm taxes reflects steadily growing demands on State and local governments for more and better public services. Many rural areas are attempting to upgrade such services, especially schools. The added costs fall largely on the property tax. Research in the past year has examined alternative methods of financing public services, especially in semi-rural areas around rapidly growing cities, and in areas of sparse and declining population.

Taxes levied on farm personal property in 1962 are estimated at \$303 million, or about a fifth as much as was levied on farm real estate. Continuing mechanization of agriculture and increasing numbers and value of livestock are contributing to the rising level of farm personal property taxes.

This uptrend, along with growing concern over the imperfections in personal property assessments, has led a number of States to review their laws pertaining to taxation of personal property, in particular farm personalty. To provide information on this topic, a report was published during the past year summarizing the tax status of the various categories of farm personal property in each of the 50 States. Research has been continued with the objective of providing improved estimates of the amounts levied on each type of farm personalty, by States, and information on procedures followed in assessing farm personal property.

Another study analyzed the incidence of the personal property tax on various income groups in Minnesota. The shifting of the personal property tax levied on each sector of the Minnesota economy--manufacturing, farming, etc.--was analyzed, and tax payments by income groups were estimated on the basis of that analysis. The study indicated that the personal property tax is regressive, with payments averaging from 1.6 percent of income in the under \$2,000 income class to 0.5 percent in the \$7,000-\$10,000 class. There is some evidence that the tax may become progressive above \$10,000 income, however. Evidence also indicates that personal property tax liabilities vary widely for taxpayers with the same income.

A study of the impact of estate and inheritance taxes on the farm enterprise, published during the year, concluded that estate and inheritance taxes are probably not typically an obstacle to maintenance of the family farm. There are instances in which they may well be an obstacle, however, and the number of these instances will grow as the average amount of capital per farm increases.

One of the major factors which influence the amount of taxes farmers pay, and the economic effects of those taxes on the farmer, is the make-up of the State and local tax system. In order to shed more light on the importance of the property tax to the farmer, a study was initiated on the effects of the property tax on the allocation of resources on the farm. This study is attempting to modify existing linear programming studies of the farm enterprise to take account of differing property tax costs of alternative enterprises. The results of the study, when it is completed, will give some idea of the extent to which State and local tax systems influence the composition of farm output.

Studies were carried out in cooperation with the Illinois Agricultural Experiment Station to determine the probable impact of alternative sources of State revenue on agriculture. The results were contained in a report to the Illinois Commission on Revenue Laws and will be published in a compendium by the Commission. One of the major findings was that broadening the base of the State sales tax to include production items would have a greater impact on most types of farms than would imposition of a State income tax designed to raise the same amount of revenue. Comparisons were made between many kinds of taxes for many types of farms. Findings of this study should be of value to farm people in other States that are considering major changes in their tax structures.

Division participation in a broadly similar study in Minnesota consisted mainly of assisting in planning the project and in assembling data on the impact of various taxes on agriculture in other midwestern States.

Considerable study was given during the year to the probable effects of proposed changes in the Federal income tax on agriculture. The results of this study were presented in testimony by the Secretary before the Joint Economic Committee and the House Ways and Means Committee. Principal conclusions were that the reduction in rates would reduce by about one-fifth



the income tax bill of agriculture, while other provisions would provide significant tax relief for the aged and those with low incomes, who compose a large part of the farm population.

An unusual amount of service work was performed for the Secretary's office in connection with these legislative proposals, and for the Treasury Department, particularly in connection with development of proposals for revising the tax treatment of income from sales of livestock.

#### B. Assessment and Methods of Assessing Farm Property

Research on farm real estate assessment has concentrated on the problem of assessing farmland located in the rural-urban fringe. Interest in this topic continues high, as a number of States have been considering special legislation or constitutional amendments to meet the problems. A report published during the year gives the complete text of the major legislative proposals and enactments, court decisions, and administrative rulings on preferential assessment of farmland.

Urban-fringe assessment problems were examined from another viewpoint in a study of assessment procedures followed, and assessed values placed, on farmland in Fairfax County, Virginia, as an illustrative urban-fringe county. Results showed that taxes on farmland in Fairfax averaged about 10 times the Statewide average. They represented slightly more than 1 per cent of full market value, about the same as the national average but double the average for Virginia. It was concluded that farmers would have difficulty paying taxes of this magnitude from farm income alone.

Research on assessment problems was continued in rural areas around Rochester, New York, and St. Louis, Missouri, in cooperation with the respective State Experiment Stations. In both projects, findings to date suggest wide variations in the relation of assessed value to appraised or market values for farms in the transition zone. The implication is that existing assessment procedures and standards are not fully applicable. Current phases of the work involve analysis of probable effects of various alternative assessment policies.

#### C. Organization and Finance of Local Government

Research was initiated during the year on fiscal problems of rural areas experiencing continued outmigration of population as a result of changes in the agricultural economy. The area selected for study includes 10 counties in Southern Iowa and Northern Missouri, several of which have been unable, under existing tax limits, to raise sufficient revenue to meet mandated expenditures. Heavy local welfare costs have been found to lie at the heart of the problem in Iowa, while in Missouri constitutional limitations on county tax rates have proved restrictive. The study aims to identify courses of action open to local government under present law, as well as alternatives for remedial legislation.



Preliminary work was also begun on studies of ways in which public services are provided and financed in sparsely populated and declining portions of New England and the Lake States. A tentative hypothesis is that differences in State systems of grants-in-aid and shared revenues account for much of the variation in fiscal problems experienced by local governments in these areas.

Research on the evaluation of local government in rural areas, concentrating on the experience of Iowa, was completed during the year and a series of reports published. Included in the results are descriptions of the current organization and functioning of local government and a review of various proposals for reform.

Work continued on a group of 5 parallel studies designed to report on and evaluate various approaches to the problems of rural government in fringe areas around growing cities, from the viewpoint of their effects on rural people. One of these, a study of city-parish consolidation in Baton Rouge, Louisiana, conducted principally by Louisiana State University personnel under cooperative agreement, found that consolidation produced significant benefits to rural areas in improved roads, drainage, and other public works, and to the entire parish in the form of more unified and efficient local government.

Another in the series concerns incorporated "agricultural cities" as found in the Los Angeles metropolitan area. This research was conducted by personnel of the University of California at Los Angeles under cooperative agreement. Preliminary findings are that incorporation provides a good but not perfect defense against annexation and urbanization. Tax and public service considerations have apparently been secondary to the desire of farm people to preserve a particular land use and way of life in the face of urban expansion.

A third study, in Alachua County, Florida, (under cooperative agreement with the University of Florida) is examining the effectiveness of the County in meeting problems caused by urban expansion. Findings to date, based on extensive interviews with County officials and other participants in the decision making process, indicate that rural people have had little influence in major policy decisions at the county level.

A fourth study concerns the township as a transitional form of government in urbanizing areas. While the township is generally declining in importance, there are throughout the Midwest a number of townships on metropolitan fringes that have incorporated as villages. A pilot study in Minnesota is testing the hypothesis that the township may play an important role in forestalling fragmentation of local government in rural-urban fringes.

The fifth in the series is a recently initiated study of the effects of extensive annexation of rural territory, as illustrated by the experience of Harris County (Houston), Texas.

Research on the effects of urbanization upon local government finance and organization, being carried out under cooperative agreement with Michigan State University, indicates that recent arrivals in the rural-urban fringe tend to be more urban-oriented and are less favorably disposed toward governmental measures such as preferential assessment that have been proposed to alleviate tax problems of farmers. Current phases of this research include study of attitudes of local people on adequacy of public services provided in semi-rural communities.

Current research findings on the problems of local government organization and finance in the rural portions of urbanizing areas were summarized in a chapter prepared for publication in the 1963 Yearbook of Agriculture.

Research on cooperation between rural local units of government in 5 selected States continued under the contract, now in its third year, with the Bureau of Government Research of Indiana University. An annotated bibliography is in process of publication. Field work was completed in 4 States (Alabama, Wisconsin, Indiana, and Pennsylvania), and is nearly complete in the fifth State (Nebraska). Preliminary drafts of reports for each State are in preparation. Findings to date indicate that interlocal cooperation offers a significant alternative to outright consolidation of local government as a means of providing public services more efficiently and effectively in rural areas.

As part of our service work, one staff member completed his assignment with the Study Committee appointed by the Secretary of Agriculture to review the farmer committee system by assisting in writing, revising, and editing the report of the Committee which was published November 28, 1962.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Estimates of Amount and Incidence of Farm Taxes

- Farm Production Economics Division. 1962. Farm Real Estate Taxes. ERS, RET-2.
- Hady, T. F. 1962. The incidence of the personal property tax. National Tax Journal 15(4), pp. 368-384.
- Hady, T. F. 1963. The impact of estate and inheritance taxes on the farm enterprise. ERS. Agr. Fin. Rev. 24, pp. 26-33.
- Heneberry, W. H. 1963. Impact on farmers of proposed changes in the State and local tax structure of Illinois. University of Illinois Dept. of Agr. Econ. Mimeograph.
- Shapiro, H. 1962. Taxation of tangible personal property used in agriculture. ERS-86.
- Stocker, F. D. 1963. Discussion of property tax as part of the fiscal system. Rural Taxation Problems. Illinois Agr. Expt. Sta. AERR-61, pp. 23-25.
- Woodard, F. O. 1963. A comparison of the regressiveness of a sales and a property tax. ERS. Agr. Fin. Rev. 24, pp. 34-39.

B. Assessment and Methods of Assessing Farm Property

- House, P. 1963. Farm taxes on the rural-urban fringe. ERS-102.
- Stocker, F. D. 1963. Selected legislative and other documents on the preferential assessment of farmland. ERS. Unnumbered.
- Stocker, F. D. 1963. Problems in assessing farmland in rural-urban fringe. ERS. Mimeograph.
- Stocker, F. D. 1963. Taxing farmland in the urban fringe. ERS. Mimeograph (unnumbered).

C. Organization and Finance of Local Government

- Hein, C. J. 1962. Rural fears allayed. National Civic Rev. 51(8), pp. 429-433.
- Press, C. and Rice, R. 1963. Farmers and suburbanization. Michigan Farm Economics, No. 242.
- Shapiro, H. 1963. Economies of scale and local government finance. Land Economics 39(2), pp. 175-186.
- Stocker, F. D. 1963. Revenues and expenditures of State and local governments in the Great Plains. Agr. Econ. Rpt. 22.
- Stocker, F. D. 1963. Local government costs and services under conditions of sparse population. ERS. Mimeograph (unnumbered)
- Wessel, R. I. 1963. Iowa rural government since 1900. Iowa Agr. Expt. Sta. Special Rpt. 32.
- Wessel, R. I. 1963. Iowa county governments face difficult problems. Iowa Farm Science 17(8), pp. 14-17.
- Wessel, R. I. 1963. How Iowa county governments operate. Iowa Farm Science 17(10), pp. 9-12.

- Wessel, R. I. 1963. Who "runs" Iowa's rural roads? Iowa Farm Science 17(12), pp. 12-14.
- Wessel, R. I. 1963. Reform county government? Iowa Farm Science 18(1), pp. 8-10.
- Wessel, R. I. 1963. Can county government costs still be reduced? Iowa Farm Science 18(12), pp. 25-27.



## AREA NO. 7. FARMLAND VALUES AND VALUATION

Problem. Trends in market values of farm real estate, the largest single asset in agriculture, and the reasons for such changes, are of continuing interest to many individuals, business groups and Government agencies. About 100,000 voluntary transfers occur each year, involving at least \$2.5 billion. Both Federal and commercial lenders need current information on trends in market values as a basis for their credit policies. Farm programs often have widespread and pervasive effects on land values.

Such longstanding interests in land values have been intensified in recent years by the growing disparity between values and farm income. Market values have nearly doubled since 1950 whereas net farm income has not changed much. This economic paradox has become of particular concern to farm mortgage lenders, and a growing obstacle to those seeking entry into agriculture. A wide range of factors other than farm income have been cited to explain the almost steady upward trend in land values, but attempts to measure the relative importance of such factors have not been successful. Realistic projections of future trends and levels of land prices, which are essential in developing meaningful models of the prospective capital and credit structure of agriculture, will require more intensive study of the numerous forces both within and outside the agricultural sector.

### USDA PROGRAM

The work involves a continuing program of research designed to obtain current information on various aspects of the farm real estate market at the State and national levels. Statistical series are developed and maintained to periodically measure changes in market values of farm real estate, rates of farm transfers by different methods, sources and terms of credit used in financing land transfers, and the sources of the demand for, and supply of, farmlands that come on the market. Two mail surveys are directed annually to farm real estate brokers and other informed people to obtain such basic information. Such data supplement the estimates of market values obtained three times a year from the regular crop reporters of the Department. Crop reporters also provide the basic data pertaining to rates of farm transfers and cash rents.

In addition to the summarization and analysis of these data in the periodic report issued three times a year, various special studies are made of new, or special features of the farm real estate market. Estimates of rates of return on market values have been developed for example, as well as special estimates of values for major classes of land, and for lands devoted to a wide range of specialty crops in California and Florida.

The national research program is supplemented with cooperative studies with State experiment stations directed toward special problems requiring more

intensive study than can be provided at the national level. Recent examples of such studies include a Wisconsin project, now completed, which focused on a group of farm operators who enlarged their farms by either the purchase or rental of additional land over a 10-year period. Previous studies in Nebraska and Kansas examined the procedures followed by both sellers and buyers in determining prices asked and paid for land, and the procedures followed in completing transactions.

Another continuing research project at the national level involves the estimation of gross and net rents paid for rented lands, annually by States. Such estimates are needed in calculating net income of farm operators by the Department of Agriculture and in the national income accounts of the Department of Commerce. Rents also provide an important independent measure of the rates of return to farmland and a useful analytical tool in the continuing study of land prices.

About 2.1 Federal professional man-years are currently devoted to all phases of the research program in farmland values and valuation. Of this total, 1.4 man-years was used on the current market developments phase of work, and 0.4 man-years on analysis of factors affecting land values and transfers. Lack of resources limited the work on farm real estate rentals to 0.1 man-years, while 0.2 man-years was devoted to program leadership.

#### REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

##### A. Current Developments in the Farm Real Estate Market

Farm real estate values resumed their upward trend at a somewhat higher rate in the 4 months ended July 1, 1963, than in the same period a year earlier. The national index advanced 3 percent to 127 percent of the 1957-59 average. The July 1, 1963 index was 6 percent above a year earlier; increases for the 12-month period ranged from 4 percent in the Northeast, Lake and Corn Belt States to 8 or 9 percent in the Southeast, Delta, Southern Plains and Pacific regions.

The total market value of farm real estate was estimated at \$148 billion on July 1, 1963, nearly \$9 billion more than a year earlier. The average value per farm advanced to nearly \$46,000 as a result of higher values per acre and the continued increase in acres per farm.

Revised estimates of net income available as a return on production assets in agriculture since the mid-1950's are a little higher than previously estimated. The income remaining in 1962, after allowances for returns to operator and family labor and to non-real-estate capital, was equivalent to 5.4 percent on the March 1962 value of farm real estate. The sharp downtrend in man-hours used in farm production in recent years resulted in smaller allowances for the labor input and somewhat larger returns to capital. Greater labor efficiency resulting from new technologies and the strong demand for additional land to better utilize these and other technological gains are being at least partially capitalized into higher land prices.

State, regional and national indexes of average value of farm real estate per acre were recomputed in terms of 1957-59 as a base in accordance with a general directive from the Bureau of the Budget. More recent weights were incorporated in the new indexes, as well as revisions in a number of States back to 1950. The revised national index shows an increase of 71 percent between 1950 and 1960, compared with 68 percent for the previous 1947-49 index. Revised estimates were made also of dollar values of farm real estate, both per-acre and total, by States from 1950 through 1963.

A special study of various aspects of investment in farm real estate developed estimates of the prices present owners had paid for the farms they now own, examined the distribution of ownership among various classes of owners, and explored the conceptual and technical aspects of gross and net investment in land and land improvements. The average cost of farm real estate owned by farm operators in 1959 was found to be about half of the current market value at that date. Capital appreciation of real estate investments, both realized and unrealized, has been a significant consideration to many individuals over the past two decades. Although accurate measures are not available, it appears likely that substantial investments of both private and public capital have been incorporated in farmlands and reflected in market values.

#### B. Analysis of Factors Affecting Land Values and Transfers

The Wisconsin study of adjustments made by farmers in two areas of the State between 1951 and 1961 was completed. Major focus was on the characteristics of the farms, and the operators who quit farming during this period, on the financial progress made by those who farmed throughout the period, and on the relative progress of new operators who started under various tenure arrangements. Only 147 of the 262 farms that existed in 1950 were still being operated by the same family as in 1950. This group of operators made substantial additions to their land acreage by purchasing or renting additional land, and also invested over \$8,000 in land improvements, buildings and equipment. Almost 70 percent of these improvements were self-financed out of current income or savings. Gross sales of these operators increased by nearly one-third, but net cash income increased by less than 10 percent. About half of the operators substantially increased their off-farm earnings. Farmers who started as owners during this period increased their earnings substantially less than did those who started as renters.

Further analysis of nearly 3,000 sales of farmlands for various nonfarm purposes showed that nearly half of these properties were bought for immediate or prospective residential purposes. Prices paid for such lands varied widely, but averaged about double the prevailing prices for land for farming purposes. They were typically fairly close to cities and on or near main highways. Although relatively few in number, sales for commercial uses such as plant sites were of smaller acreages, but at higher prices than the sales for residential purposes.



Another important type of sale reported was for timber and pulpwood production, private recreation, and public uses such as highways and parks. Such sales occurred most frequently in the Southeast and Northeast sections of the country and were of relatively large acreages. Sales prices were often less than for typical farmlands in the area, and were located farther from cities and hard roads than were the properties bought for residential and commercial purposes.

Some progress was made also in a special analysis of sellers as a source of farm real estate credit from the 1960 sample Census of Agriculture. Nearly one-fourth of the farms reporting major real estate debt owed such debts to the individual from whom they bought the farm, and the amount owed to such lenders accounted for 30 percent of all real estate debt. Farms with seller-financing were larger, the average debt was higher, and the farm operators were younger than the farms financed by commercial lenders.

Nearly 40 percent of the farms with seller-financing had been bought under an installment land contract in which title remains with the seller until the specific terms of the contract have been met. The unpaid balance of such contracts amounted to \$2.2 billion, or about 18 percent of total outstanding farm real estate debt in 1960. The ratio of contract debt to market value was substantially higher than for commercial lenders because of the smaller initial downpayments involved in contract sales, and the relatively recent date of purchase by those using land contracts.

### C. Agricultural Rents

Gross rents were tentatively estimated at \$3.6 billion in 1962, slightly higher than in 1961 because of the continued rise in cash rental rates and some increase in the value of crops produced on rented lands. Preliminary estimates from the 1959 census indicate only a slight decline in the total acreage of rented farmland since 1954. The increase in the proportion of part-owners and in the acreage of land they rent has about offset the decline in the acreage of land in tenant farms. The value of farmlands and buildings rented was about \$47 billion in 1959, or 38 percent of the value of all land and buildings.



PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Current Developments in the Farm Real Estate Market

Farm real estate market developments. Three issues: CD-62, Dec. 1962; CD-63, Apr. 1963; and CD-64, Aug. 1963.

Gale, J. F. 1963. What makes farm real estate prices? Agricultural Finance Review, Vol. 24.

Scofield, W. H. 1963. The rural land market - a look ahead. The Rural Realtor, Feb. 1963, pp. 4-7.

Scofield, W. H. 1963. Investment in farm real estate. Jour. Farm Econ., 45(2), pp. 396-406.

Scofield, W. H. 1962. Land values and competition for land. For 1963 Yearbook of Agriculture.

B. Analysis of Factors Affecting Land Values and Transfers

Dorner, P. and Sandretto, C. 1963. Resource adjustments, income growth and tenure, two Wisconsin dairy areas, 1950-60. Wis. Agr. Expt. Sta. Res. Bul. 242.

C. Agricultural Rents

None.

## AREA NO. 8. ECONOMICS OF FARM PRACTICES AND TECHNOLOGY

Problem. New and rapidly changing technology is having profound effect on agriculture. Ever-changing conditions of production brought about by new machines, new-type structures and related equipment, and improved methods of crop and livestock production require continual economic study to provide farmers, policy makers, and industries serving agriculture the guidelines for decision in a changing economic environment. Such studies must measure and keep abreast of major changes in farming technology and must appraise the implications of these changes for the future. These studies should include analyses to provide information needed by farmers in different situations as they adjust to changing conditions of technology, prices, and costs. They should also include analyses aimed at guiding policy makers and program administrators as well as at helping industry to meet better the needs of farmers.

### USDA PROGRAM

This is primarily applied research, consisting of a continuing program of collection and analysis of data bearing on national situations and of the study of certain important innovations in farm practices and technology. Included is the development of aggregative measures of the effects of technological changes on farm output, costs and income.

More specifically, the work involves the collection of pertinent data and the economic analysis of developments in farm mechanization and structures, in the use and effects of fertilizer and related crop practices, and in the production and utilization of livestock feed. These activities center in Washington, D. C. and consist mainly of broad national studies dealing with both the supply aspects and the demand aspects. They usually involve at least informal cooperation of other USDA agencies, particularly the Statistical Reporting Service and the natural science groups dealing with mechanization, crop practices, and livestock feeding. The research results are normally presented in aggregative terms for areas, States, or regions, along with supporting data such as input-output ratios. Intensive studies of narrower scope are made occasionally in selected areas to obtain information to supplement national and regional data from other sources. Such studies are usually in cooperation with State experiment stations, currently in Iowa and Michigan.

The manpower currently devoted to this program is estimated at 9.0 professional man-years, with 0.7 in program leadership, 1.7 on economics of farm mechanization and associated techniques, 0.8 on economics of farm structures and materials handling, 1.0 on economics of fertilizer use and crop technology, 3.1 on economics of feed use and feed-livestock relationships, and 1.7 on inventory of production practices. A research contract was entered into with Iowa State University in June 1963 for a survey and certain analyses on the economics of farm service buildings.

## REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

### A. Economics of Farm Mechanization and Associated Techniques

The numbers of major machines on farms in the United States are estimated annually, and the results have shown generally increasing numbers for several decades. The rate of increase has varied somewhat for different machines and for different years but the pattern has been a general and rather substantial increase year after year, with some slowing down or declines in recent years. The numbers of certain important machines on farms, such as wheel tractors, grain combines, automobiles, and milking machines, reached peaks in the past few years and have since declined. Other machines, such as pickup hay balers and field forage harvesters, are still increasing materially in numbers. It appears that increases in size and capacity have been sufficient to more than offset the tendency for some machines to level off or decline in numbers. The number of field tractors on farms, for example, increased 38 percent from 1950 to 1963 while the total available horsepower of these tractors increased about 83 percent.

As these machines on U. S. farms have increased in number, their average annual use, in terms of acres covered, has generally declined. For example, the average grain combine owned by farmers covered about 250 acres in 1940 but only around one-half as much in recent years. Similarly, the average field tractor was used 592 hours in 1947 and 450 hours in 1959.

Declining use suggests a decrease in efficiency of machine use but offsetting this, at least in part, is the improved timeliness of operation made possible by the reduced load per machine. The average annual use of some machines is so low, however, that on many farms the economic question of ownership versus custom hiring or machine rental can well be raised. This is particularly true of field forage harvesters, small combines, and 1-row cornpickers, which in recent years have had average annual use of only 36-60 acres. Even if one of these is to be bought as a used machine with a low investment cost to the present owner, a farmer planning to use it on less than the average acres per year is likely to find it worthwhile to explore the alternatives of custom hiring or renting.

Research is in progress on the aggregate demand for farm machinery. At present, this work is limited to farm tractors for different regions and for the nation as a whole. Various economic models are being tested for their effectiveness in explaining the past and their ability to forecast future changes.

### B. Economics of Farm Structures and Materials Handling

In March 1963, research was started in Iowa on the economics of farm service buildings. The objectives are not only to obtain results for Iowa but also to develop methodology that can be applied to broader regional and national studies of the demand for farm structures. A research contract was entered

into with Iowa State University in June to conduct a study to develop data on, and an understanding of, the economic contributions of, and demand for, farm service buildings as technology changes and as farms consolidate.

### C. Economics of Fertilizer Use and Crop Technology

Revision of the models used in pilot studies in Georgia and Missouri, of micro and macro effects of changes in farm technology has been completed. The principal revision is inclusion of farm forestry coefficients applicable to classes of land not suitable for annual crop production. These studies involve determination of optimum size of farm for different levels of income at present and at improved levels of crop technology. As land is regarded as a variable input, land buying activities are included in the models. Earlier work showed that much land would be left unused; hence tree planting for open land and woodland improvements for land now in woods have been added to the models. Following these changes, new solutions are being obtained preparatory to publication of results.

In addition to results reported last year, another example selected from present work discloses effects of doubling the wage rate (from \$0.75 to \$1.50 per hour) for hired labor. For crop-beef farms in the Georgia Piedmont with corn-selling excluded from the model, to obtain a \$6,000 net operator income, doubling the wage rate would require a 19 percent increase in acreage, a 29 percent increase in gross income, and a 12 percent increase in the capital investment. The return to capital and management would be reduced by 30 percent. There would be no change in the crop rotation of corn-Coastal bermudagrass. The livestock enterprise, consisting of calves wintered and grazed on summer pasture, would be increased by 73 percent. The return per-dollar cost for the farm as a whole would be reduced by 7 percent.

Also, for crop-beef farms without corn-selling in the model, the effect of improved crop technology other than fertilizer on resources required for a net operator income of \$5,000 would be to reduce the acreage by 55 percent, the gross return by 43 percent, and the capital investment by 48 percent. Return to capital and management would be increased by 52 percent. The 560 hours of hired labor required under present technology would be eliminated, and operator labor requirements would be reduced by 44 percent. The corn-Coastal bermudagrass rotation would largely be replaced by a cotton-(rye) rotation. For both present and improved crop technology (other than fertilizer), the crop coefficients reflect use of fertilizer at rates optimum for limited capital situations, i.e. at rates such that marginal return to fertilizer is equal to average return per dollar cost of other variable inputs.

Estimates of yield response to fertilizer by agricultural subregions are being obtained from technical specialists in the States through plans developed jointly with representatives of ARS and FES. These estimates are averages for the area as a whole, based on agronomists' estimates of yield response, covering 1962 growing conditions. The yield equation was developed



from the estimates of response so that calculated yields per fertilized and per unfertilized acre weight out to equal the 1962 reported yield per harvested acre. Such estimates have been completed for corn in Missouri and Michigan. A primary purpose is to develop area-wide crop coefficients for use in estimating aggregative effects of changes in technology. In addition, some micro results are developed for use by crop and farm management specialists in the States.

For each agricultural subregion, the micro analysis shows the optimum combination of plant nutrients and yield at each of a series of marginal returns to fertilizer up to the most profitable rates per acre. Along with this is shown the range in rates at which fertilizer substitutes for land in growing corn. The variable cost per bushel is shown for different levels of application, including that at the point of minimum unit cost when other costs are specified.

For example, for Agricultural Subregion 70 (N.W. Missouri) with other costs assumed at \$25 per acre, a ton of plant nutrients substitutes for 5.9 acres in producing a yield of 77.5 bushels for a cost per bushel of \$0.439 (minimum cost point) when nutrient rates are 37, 31, and 28 pounds per acre of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O, respectively. The marginal return to fertilizer and to other variable inputs combined at the minimum cost point is \$2.28. For most profit per acre, the rates would be 80, 52, and 50 pounds of the nutrients for a yield of 90.6 bushels, and a cost per bushel of \$0.470 at which point a ton of nutrients substitutes for 2.2 acres.

In the spring of 1963 work was started in Michigan on the aggregative demand for fertilizer. The initial steps will attempt to develop suitable models and methodology for analyzing the demand for this important farm input.

#### D. Economics of Feed Use and Feed-Livestock Relationships

Research is carried on at the national level to determine the effects on feeding efficiency of new technology in livestock feeding and management. The data have been revised and updated through the 1963-64 feeding year. A publication is in press, which revises feed consumption data at the national level previously published for the feeding years 1940-56, and makes available new estimates for the years 1957-59 based on revised USDA data. Estimates for the feeding years 1960-63 have been prepared and will be published in a separate bulletin, since these data are subject to revision as more complete information becomes available. These studies show that in recent years, very high feeding rates for hogs and possibly beef cattle on farms would need to prevail for current livestock numbers to consume the concentrates estimated to disappear annually. This is noted even though greatly increased amounts of concentrates were allocated to milk cows. Feed grain-livestock balances by States, prepared in connection with Civil Defense, have been updated through the 1962-63 feeding year. Similar balances for hay production plus stocks May 1, 1963, and consumption for the feeding year 1962-63, have been prepared to assist in indicating needs and sources for

hay shipments into drouth areas. This calculation indicated the principal hay deficit areas in 1963 to be in the South and Southeastern States from Virginia west to New Mexico. Colorado and Kansas were also deficit areas.

Studies of feed consumption, including roughages, have been instituted to determine feeding rates for various types of livestock in each of the States. Field work has been completed in about 15 of the States. Preliminary computations are under way.

Research on economic evaluation of pasture production was undertaken. A subcommittee of a representative group from interested agencies developed and submitted for review a farm schedule designed to determine how much livestock production comes from each of the several types of pasture. During the current fiscal year the questionnaire will be used to interview a limited number of farmers. The information about this small group will serve as a basis for evaluating the feasibility of obtaining enumerative type data on range and pasture resources for a sample of all farms and ranches in the United States.

#### E. Inventory of Production Practices

Final results from a national survey of farm consumption of liquid petroleum fuels in 1959 show a total use of 8,610 million gallons. This was a decline from 8,808 million gallons estimated to be used in 1953, the year of our last previous survey. The decline was due largely to a decrease in numbers of automobiles on farms.

Fuel use in self-propelled machines was estimated for the first time in 1959 and amounted to about 115 million gallons. This was about 30 percent of the fuel used in all power units on farms other than tractors, motortrucks, and automobiles.

Farm-household use of liquid petroleum fuels increased from 1,577 million gallons in 1953 to 1,737 million gallons in 1959.

Work was completed on summarizing national information on methods of harvesting small grains and corn for grain in 1960, and the final report is being prepared. The combining of small grains (wheat, oats, rye, barley, flaxseed) increased from 84 percent of the acreage in 1950 to 97 percent in 1960. In 1950, 61 percent was combined as standing grain, and 23 percent from the windrow. In 1960 the corresponding percentages were 70 and 27. More than 60 percent of the 1960 small grain acreage was harvested by self-propelled combines and 36 percent by pull-type combines. Custom operators with combines harvested about 20 percent of the small grain acreage in 1960.

Corn harvesting has changed substantially in recent years. The percentage of the acreage harvested with mechanized pickers (excluding picker-shellors) has declined slightly since 1956, and in 1960 was 75 percent. However, the percentage harvested with picker-shellors has increased materially, expanding

from 3 to 15 percent during 1956-60. Custom operators accounted for about 1/3 of the field shelling in 1960.

A manuscript containing estimates of extent and rates of principal plant nutrients used on individual crops in 50 States and Puerto Rico in 1959 was completed during the year. It is in process of publication under the title "Fertilizer Used on Crops and Pasture, 1959 Estimates." In contrast with similar estimates for 1954, the 1959 estimates were developed not only by States but by State parts of agricultural subregions and for each of 99 agricultural subregions as a whole. Among the crops, corn received the most fertilizer, about 40 percent; hay and pasture, 13 percent; cotton, 9 percent; vegetables, 9 percent; fruits and nuts, 4 percent; and tobacco, 3 percent of the total nutrients used in 1959. All close growing crops combined accounted for about 15 percent.

A manuscript, "1963 Fertilizer Use in Indiana," is being published in the Purdue University Research Mimeograph Series.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Economics of Farm Mechanization and Associated Techniques

None.

B. Economics of Farm Structures and Materials Handling

None.

C. Economics of Fertilizer Use and Crop Technology

None.

D. Economics of Feed Use and Feed-Livestock Relationships

Hodges, E. F. Livestock production units, 1910-1961. 1963.  
USDA Stat. Bul. 325.

Hodges, E. F. Animal units of livestock fed annually, 1909-1961.  
USDA Stat. Bul. 324.

E. Inventory of Production Practices

Strickler, P. E. and Harrington, B. J. 1963. Liquid petroleum fuel used by farmers in 1959. A preliminary report. Mimeograph (unnumbered).



## AREA NO. 9. FARM COSTS AND RETURNS

Problem. In this period of current and prospective rapid changes and adjustments in agriculture, it is very important to have available comprehensive and reliable data over time on farm investment, operations, production, costs and returns for various types and sizes of farms. Such data and analyses based on them are essential for intelligent policy and operating decisions by the agencies and industries serving agriculture, and by farmers themselves.

### USDA PROGRAM

The work on costs and returns by major types of farms is a continuing study of operations of typical or representative commercial farms to determine changes in size of farm, organization, investment, productivity, receipts, expenses, net farm income, physical inputs, farm output, prices received for products sold, and prices paid for goods and services used in production. Budgets are prepared annually to provide current information. Estimates for earlier years are revised as new information becomes available. Analyses are continually underway to show the effects of economic and technical changes on land, labor, and capital requirements, production, production efficiency and incomes of typical or representative commercial farms. Estimates of the trend in costs and efficiency of the production of cotton are currently maintained. Nearly all the work is done in Washington with informal cooperation with States where the studies are located. Formal cooperation exists with Kentucky, and is being developed with several other experiment stations.

Work on cost of production of farm commodities has been discontinued as a separate research project and included as part of the project on costs and returns by major types of farms. Nearly all the work was done in Washington with informal cooperation with the States where the studies were located.

A total of 9.4 Federal professional man-years were devoted to all costs and returns work, with 0.7 devoted to program leadership and 8.7 devoted to costs and returns by major types of farms.

### REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

#### A. Costs and Returns by Major Types of Farms

Annual estimates have been made for 1962 to bring up to date the continuing series on costs and returns of typical or representative commercial farms in the major producing areas in the United States. The report for 1962 covered 39 types of farms, the same number as in the previous year. However, the 1962 report carried a revision of the tobacco series in the Coastal Plain of North Carolina, supplanting the 3 series formerly presented, namely tobacco-cotton (large), tobacco-cotton (medium) and tobacco (small) farms, with 2 series--typical tobacco and typical tobacco-cotton farms. Consultation with economists at North Carolina State College indicated that the latter farm

types are now far more important and significant than the former types, and so the series were revised. A new series--typical broiler farms in Maine--was added, leaving the total the same as in 1961.

In 1962 net farm incomes were higher than a year earlier on 24 of the 39 types of farms. Changes in incomes varied considerably even within major groups of farms. Western livestock ranches were the only group where changes in income were in the same direction for all farms, and even here the increases varied from 1 to 73 percent. Net farm income increased in 1962 on 6 of the 7 types of wheat farms, while 4 of the 5 dairy farms had lower incomes. The greatest percentage increase in income from 1961 to 1962 occurred on wheat-small grain-livestock farms in the Northern Plains. But, because of a drought, income in 1961 on these farms was the lowest since 1937. The largest decline in income occurred on the nonirrigated cotton farms in the High Plains of Texas, but incomes in 1961 on these farms were a record high. All farm types on which incomes increased in 1962 either had higher farm production or received higher prices for products sold, or both. Lower incomes in 1962 were due to higher expenses as well as to changes in production and prices received.

Net farm incomes in 1962 were higher than in 1951-55 or 1956-60 on most of the 39 types of farms. They were from 7 to 15 percent higher than in 1956-60 on 32 of the 39 types, about the same on 3 types and from 3 to 31 percent lower on 4 types of farms. Compared with 1951-55, incomes were higher in 1962 on 35 of the 39 types and lower on 4.

Work on broiler farms in north Georgia was continued, and work on desert-operated sheep ranches in west central and southern Utah, and cattle ranches in east central Idaho and southwestern Montana, was resumed.

Data on nonfarm income have been obtained for 1962 on hog-fattening--beef raising farms in the Corn Belt, cattle and sheep ranches in the Southwest, peanut-cotton farms in the Coastal Plain, egg-producing farms in New Jersey and broiler farms in Georgia. These data will be incorporated in the costs and returns series as data for more years are obtained. Where off-farm employment and other sources of nonfarm income are significant, they will play an important role in explaining why farmers change their operations in view of certain economic stimuli.

Analysis of production response has been started on peanut-cotton farms in the Coastal Plains. This work uses data collected for the costs and returns series on these farms.

Estimates and analyses of changes in costs and efficiency of cotton production for 1947-61 are being prepared. Preliminary estimates indicate that the total quantity of inputs used per bale of cotton produced in the United States dropped about 20 percent from 1947-49 to 1959-61. The overall increase in efficiency of cotton production can be attributed largely to the 50 percent increase in per acre yield obtained with about a 20 percent larger quantity of inputs per acre. This enabled cotton farmers to produce an aggregate output in 1959-61 equal to that of 1947-49, but with about a third less acreage.

The substitution of nonfarm inputs such as machinery, fertilizer, and pesticides, for inputs of land, labor, and farm-produced power in an important factor leading to increased efficiency.

Since 1947-49 the overall increase in prices paid for inputs used in cotton production has offset to a considerable degree the increase recorded in physical efficiency. The extent to which price changes have counterbalanced efficiency gains depends greatly on whether we include or exclude inputs and costs of land and overhead items in the calculation. Prices of land and overhead items increased substantially more than prices of other "direct" inputs in cotton production. Prices of direct inputs increased 14 percent over the period whereas prices of all items, including land and overhead, increased nearly a third. Direct costs per bale decreased 8 percent from 1947-49 to 1959-61. When land and overhead estimates are included, however, costs per bale increased 6 percent over the period. Substantial annual variations occurred in both inputs per bale and costs per bale, resulting largely from yield variations associated with weather and related factors. Preliminary indications are that marked regional differences occurred in direct inputs and costs per bale. Apparently all of the 6 major regions recorded increases in efficiency of cotton production, as measured by direct inputs per bale. However, only moderate gains occurred from 1947-49 to 1959-61 in the Southeast, Mid-South, High Plains, and Central Texas-Oklahoma regions. More substantial gains were registered in the Delta-Brown Loam, Texas-Oklahoma Plains, and the Western Irrigated regions. Similar regional differences prevailed with respect to trends in direct costs per bale of cotton. Further analysis of regional changes is underway.

A manuscript on cost of owning and using farm machinery by size of farm in northwestern Ohio is being prepared. The 3 sizes of farms studied were 80, 160 and 320 acres of total farmland. Total costs of owning and operating 13 major implements averaged 52.6 percent higher on the 80 acre than on the 320 acre farms; they were 20.5 percent higher on the 160 acre farms than on the largest farms studied. Total costs are shown as costs per acre of use, including costs of implement, tractor and driver. Costs were highest on the smaller farms mainly because of lower annual use per machine, but the annual cost per implement was lower because the machines were older and somewhat smaller.

Two issues of "The Farm Cost Situation" were published during the reporting period. In the latest of these, issued on May 1963, farm production expenses totaled \$27.7 billion in 1962, or about \$0.6 billion more than in 1961. In the first quarter of 1963, they were a little higher than a year earlier, and are expected to total \$28.2 billion for 1963 as a whole. The increase in 1962 over the year before was due to slightly higher prices paid for about the same total volume of production inputs purchased. The rise in farm production expenses since the early 1950's, however, resulted from approximately equal percentage increases in the volume of purchased inputs, and in the level of prices paid for them. Farm wage rates averaged slightly higher in 1962.

Prices of farm tractors, machinery, and equipment have been rising for several years. Farm service buildings continue to be an important item in farm capital investment. The average cost per unit of plant nutrients in fertilizer has declined in recent years, chiefly because of increasing use of higher-analysis materials. In the winter of 1962-63, feed grain prices were slightly higher and high-protein feed prices were sharply higher than a year before. Interest rates in 1962 averaged a bit higher than the year before. Prices of farm real estate continued their upward trend. On most types of farms for which costs and returns estimates are available, prices paid for production items purchased in 1962 were a little higher than the year before, a continuation of a general upward trend since the early days of World War II.



PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Costs and Returns by Major Types of Farms

Brown, W. H. 1962. Costs and returns, commercial cotton farms, 1961. ERS, FCR-8.

Brown, W. H., Lee, J. E., Jr. and Hole, E. 1963. Costs and returns, commercial cotton farms, 1962. ERS, FCR-12.

Cummins, D. E. 1963. Costs and returns, commercial dairy farms, northeast and midwest, 1962. ERS, FCR-16.

Goodsell, W. D. and Gray, J. R. 1963. Costs and returns, western livestock ranches, 1962. ERS, FCR-15.

Goodsell, W. D. and others. 1962. Farm costs and returns, commercial farms, by type, size and location. AIB 230, revised October 1962.

Goodsell, W. D. and others. 1963. Farm costs and returns, commercial farms, by type, size and location. AIB 230, revised August 1963.

Hole, E. and Vermeer, J. February 1963. Wheat growers' machinery costs by size of farm in central North Dakota. Agr. Econ. Rpt. 24.

Hurd, E. B. 1963. Costs and returns, commercial wheat farms, Pacific Northwest, Northern Plains, Southern Plains, 1962. ERS, FCR-17.

Rosenberry, P. E. 1963. Costs and returns, commercial Corn Belt farms, 1962. ERS, FCR-9.

Shugars, O. K. 1963. Costs and returns, commercial tobacco farms, Coastal Plain, North Carolina, 1962. ERS, FCR-11.

Shugars, O. K. and Bondurant, J. H. 1963. Costs and returns, commercial tobacco-livestock farms, Bluegrass area, Kentucky, 1962. ERS, FCR-14.

Starbird, I. R. and Vermeer, J. 1962. Crop production practices and costs by size of farm, Delta area, Mississippi, 1957-58. Agr. Econ. Rpt. 21.

Stoddard, E. O. 1963. Costs and returns, commercial egg-producing farms, New Jersey, 1962. ERS, FCR-10.

Stoddard, E. O. 1963. Costs and returns, commercial broiler farms, Delmarva and Maine, 1962. ERS, FCR-13.

Farm Production Economics Division. The farm cost situation.  
1962. ERS, FCS-33.

Farm Production Economics Division. The farm cost situation.  
1963. ERS, FCS-34.

## AREA NO. 10. FARM LABOR UTILIZATION AND PRODUCTIVITY

Problem. The utilization of human effort in farm production has been changing greatly in recent decades and will likely change even more rapidly in the years to come. Technological and other economic developments increase the productivity of individual workers and make possible a decrease in the number of persons engaged in farmwork. But these developments require higher levels of skill and knowledge on the part of the persons continuing to do farmwork, while forcing other workers to seek nonfarm employment. At the same time, the increasing attractiveness of nonfarm jobs together with various social and economic changes exert upward pressures on earnings and perquisites in many types of farm employment. Because of the many economic, social, and other changes that are affecting the utilization of human effort in farm production, a better understanding of these changes is needed to assist in planning for and guiding the human and economic adjustments involved.

### USDA PROGRAM

Work on farm labor requirements and use is carried on as a continuing program in Washington, D. C. This work is aimed at keeping abreast of farm labor used, nationally and by regions, in total and by major enterprises. Estimates of man-hours of farmwork are prepared annually, based on pertinent secondary data and, when necessary, by field surveys. This series of estimates, going back to 1910, gives a comprehensive statistical picture of what has happened to farm labor requirements over the years.

A continuing program of farm labor productivity and efficiency is conducted in Washington, D. C. It provides annual indexes of farm production per man-hour, with breakdowns by regions and by major commodities. The series of estimates provide comprehensive measures of farm labor productivity over the years. Periodically, analyses are made of the past and projected future effects of technological and other developments on production per man-hour and on quantity of labor input used.

Research on the economics of farm labor utilization is conducted. Some of the important long-term developments in U. S. farming have been the substitution of capital for labor, the discovery and adoption of labor-saving technologies of production, and the substitution of skilled for relatively unskilled human effort. Research to understand these developments and the related farm-labor adjustments is for the most part done through special studies in selected situations. Some research is located in Washington, D. C. and some at field locations. Several current projects are cooperative with the State agricultural experiment stations of California, Iowa, and Arkansas.

The economic relationships between farm operators and hired farmworkers constitutes another line of study. In certain types of farming and geographic regions, hired farmworkers are becoming a relatively larger segment of the

farm workforce. Economic relationships between farm operators and hired farmworkers are becoming more complicated and less determined by custom, with the basic character of these relationships also often changing. In addition to their other managerial functions, many farm operators are now of necessity exercising a personnel function in an employer-employee relationship. Such problems are involved here as: Seasonal peaks in labor requirements; the development of workers' skills; training of workers for particular jobs; management of workers; and determination of incentives such as the levels of wages and perquisites (including housing) and of the other terms and conditions of employment. Hired workers likewise find that they may face new or more difficult problems growing out of technologic displacement of old tasks, shifts in areas of production, longer and more frequent periods of unemployment during the year, and the necessity to learn new and more exacting skills and work habits. Research presently under way in this sub-area is cooperative with the Oregon Agricultural Experiment Station.

A total of 6.1 Federal professional man-years is devoted to this research area, distributed as follows: Program leadership, 0.5 man-year; farm labor requirements and use, 1.8 man-years; farm labor productivity and efficiency, 0.4 man-year; economics of farm labor utilization, 3.0 man-years; and economic relationships between farm operators and hired farmworkers, 0.4 man-year.

#### REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

##### A. Farm Labor Requirements and Use

The continuing research on labor requirements and use in farm production showed that labor used on farms in 1962 reached a record low of 9.1 billion man-hours. This was a decrease of 4 percent from 1961, and represents a continuation of the downward trend that started at the end of World War I. Farm labor used in 1962 was only 38 percent of the 24 billion man-hours required during the peak year 1918. The long-term decrease has resulted from a combination of many forces, the most significant of which are advances in technology, reduction in number of farms, and increases in size of farms and of farm enterprises.

Growing and harvesting crops in 1962 took 4.2 billion man-hours of labor and work on livestock required 3.7 billion. These hours constituted 46 and 41 percent, respectively, of all farmwork. The remaining 13 percent consisted of farm maintenance or overhead work. In 1910, these proportions were: crops, 56 percent; livestock, 29 percent; and farm maintenance work, 15 percent. These changing proportions resulted chiefly from greater advances in mechanization of work on crops and from a smaller increase in total production of crops than of livestock.

These estimates of man-hours of farmwork for crops and livestock in 1962 are based on projections of unit labor requirements for 1959. These 1959 "benchmark" estimates were developed by States. Three manuscripts containing them have been largely completed. The first covers labor used to produce livestock;



the second, labor used to produce field crops; and the third, labor used to produce vegetables.

The estimates for livestock indicate that size of herd or flock is related inversely to labor used per head. For example, commercial laying flocks averaged 1,550 birds per farm and required about one hour of labor per hen or pullet. Layers in noncommercial flocks of less than 400 birds took an average of 1.6 man-hours. The largest average herd of milk cows was in California where there were 39 cows per farm reporting. Labor requirements were lower there than in any other State. These differences are not exclusively due to size of operations. Farmers with large herds or flocks also tend to have more machinery and equipment and use labor-saving practices to a greater extent than those operating on a smaller scale.

Estimates for field crops show considerable variation among States and regions in the amount of labor used for the same crop. Greatest variations occur between irrigated and non-irrigated operations and between the different methods of harvesting crops. In addition, the influence of scale of operation and terrain on the amount of time required for a given operation is indicated. For example, wheat is a major enterprise in the Northern Plains. Acreages and fields are large, relatively level, and free from obstructions. Large combines are operated at sustained high rates of speed. An average of only 0.8 man-hours per acre was required for combining wheat as standing grain in each of the 4 States making up this relatively homogeneous region. By comparison, an average of 1.7 man-hours per acre was used in the Appalachian region where relatively little wheat is produced, and acreages are small. Small and irregularly shaped fields and uneven topography dictate the use of relatively small combines. Small combines harvest less acreage per hour than their larger counterparts in the Plains. In addition, considerable time is lost by the numerous starting, stopping, and turning operations necessary in the small fields.

Labor used per acre of vegetable crops varies with the type of crop, its market use, and the area where grown. In 1959, green peas for processing, seeded as a close-grown crop rather than in rows, took 11.3 hours per acre. Brussels sprouts for the fresh market, grown in rows took 47 times as much labor or 536 hours per acre. Fresh market vegetables took more than twice as much labor per acre than those grown for processing, 112 and 63 hours per acre, respectively. Location has an important bearing on labor inputs; only 170 hours were used per acre of Brussels sprouts in Texas while 563 hours were required in California. Preharvest labor inputs were similar, but greater production per acre in California resulted in high harvest labor requirements--488 hours per acre.

As secondary data were not generally available for estimating labor requirements for truck crops, primary data thereon were collected by a private research firm under contract. Interviewed were almost 2,500 growers who harvested almost 219,000 acres of truck crops in 12 major producing areas. Data collected included the amount and kind of labor used on each field

operation, production practices, material inputs and costs, and contractual arrangements between producers and buyers. Analyses of these data continued. Eight research reports have been prepared. Four of them were published during the reporting period; two were published earlier.

#### B. Farm Labor Productivity and Efficiency

The continuing research on labor productivity and efficiency in farm production showed that farm output per man-hour in 1962 was almost 6 percent higher than in 1961. The index of 127 (1957-59=100) was an all-time peak, but the percentage increase from 1961 was less than the rate of growth during the last decade. Farm output per man-hour almost doubled from 1952 to 1962. Contrary to long time trends, the growth in production per man-hour from 1961 to 1962 was greater for livestock (5.8 percent) than for crops (4.2 percent). An hour of work on livestock in 1962 produced 2.9 times as much as in 1910-12, but an hour of crop work produced 5.2 times as much as a half century ago.

The significant increase in production per unit of farm labor is also shown by another productivity ratio; that is, the number of consumers of farm products per farmworker. In 1962, the ratio was 1 worker to 29 consumers; in 1952 1:16 and about 1850 it was 1:4. A greater increase occurred in the last decade than during the previous century. Most of the consumers of U. S. farm products in 1962 were domestic residents, but about 14 percent of them were citizens of foreign countries and were supplied through exports from this country. On the other hand, an equivalent of about 10 percent of the U. S. population was fed and clothed through imported products.

Two chapters of an administrative report on hired farm labor were prepared in response to a request from the Secretary to the Administrator of ERS. For this report, the demand for total farm labor, as indicated by average annual employment, was projected to be 5.8 million workers in 1967 as compared with 6.9 million in 1961. The decrease in hired workers would total 137,000 or about 7 percent of the 1961 number. Operators and unpaid family workers would drop 19 percent and 24 percent, respectively, from 1961 to 1967. Projected numbers of workers were premised on comparable projections of farm production, of the level of mechanization and automation, and of the structure of agriculture.

The second chapter deals with the importation of workers from foreign countries for jobs on U. S. farms. The current program started during World War II and involves chiefly workers from Mexico. The effects of the importation program on workers from domestic sources, on farmers, and on other parts of the economy are traced. The effects on the Mexican economy are also outlined.

### C. Economics of Farm Labor Utilization

A project on labor and capital in selected crops and areas in California is underway in cooperation with the California Agricultural Experiment Station. The first area studied was Kern County where cotton is the dominant crop and potatoes and fruits are next in importance. At the current level of adoption, mechanization has displaced workers and reduced seasonal labor peaks. At a more advanced stage of mechanization which is in prospect, the development of a stable resident seasonal labor force appears economically possible. If this materializes, farmworkers will need to become less specialized and to adapt more easily to different tasks during the season. These and other detailed findings are presented in two manuscripts now being reviewed for publication. A third report is in preparation.

Stanislaus County is the second area of study. Demand for seasonal workers is increasing in this area because of additional acreages of high labor using crops, such as peaches and tomatoes. Some mechanization is occurring but it tends to accentuate seasonality of labor use rather than to level labor demands. Collection of data from seasonal workers was completed during the year. Workers in the sample included Mexican Nationals (both contract and immigrant or "green card" workers), Spanish-Americans, Anglo-Americans, and Negroes.

The production and marketing phase of a study of the pecan industry, cooperative with the Marketing Economics Division of ERS and the experiment stations of Arkansas, Florida, Georgia, Mississippi, New Mexico, and South Carolina was completed. Labor requirements for producing pecans have decreased as a result of increased mechanization, particularly in the harvest operation where pecans are shaken from the tree and picked up mechanically. A report is in press.

An econometric study of factors affecting the demand for farm labor is cooperative with the Iowa Agricultural Experiment Station. The study is regional and national in scope. Work during the year was concentrated on the development of regional economic variables, such as farm and nonfarm wage rates and employment levels, and prices and utilization of farm production inputs that compete with labor.

### D. Economic Relationships Between Farm Operators and Hired Farm Workers

A study of the cost and feasibility of alternative methods of providing housing for migrant hired farmworkers is underway in cooperation with the Oregon Agricultural Experiment Station. Four areas of Oregon, differing with respect to labor-intensity of crops, type and seasonal employment of workers used, and housing arrangements, are being studied. A survey of growers, camp operators, and workers was completed in each of the four areas. More than 400 interviews were conducted. Indications are that on-farm housing dominates in both the tree fruit area and the strawberry-pole bean area. Off-farm housing that is centrally located predominates in the row crop (sugar beets, onions, and potatoes) area.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Farm Labor Requirements and Use

Gavett, E. E. 1962. Truck crop production practices--Broward and Palm Beach Counties, Florida. ERS-79.

Gavett, E. E. 1962. Truck crop production practices--Colquitt County, Georgia. ERS-82.

Gavett, E. E. 1963. Truck crop production practices--Cameron and Hidalgo Counties, Texas. ERS-115.

Gavett, E. E. 1963. Truck crop production practices--Imperial County, California. ERS-128.

B. Farm Labor Productivity and Efficiency

Farm Production Economics Division. 1962. Changes in farm production and efficiency. USDA Stat. Bul. 233, Revised.

Farm Production Economics Division. 1963. Changes in farm production and efficiency. USDA Stat. Bul. No. 233, Revised.

Hecht, R. W. 1963. Persons supplied by one farm worker. Agricultural Situation, 47(6), p. 6.

C. Economics of Farm Labor Utilization

None.

D. Economic Relationship Between Farm Operators and Hired Farm Workers

None.



Line Project Check List -- Reporting Period Sept. 1, 1962 to Sept. 1, 1963

Work & Line Project Number	Work and Line Project Titles	Work Locations During Past Year	Line Proj. Incl. in Summary of Progress	Area & Subheading
FE 1	Farm capital, credit, and financial condition			
FE 1-1	Maintenance and improvement of farm-mortgage statistics	Washington, D.C.	Yes	4-B
FE 1-2	Production credit in agriculture--maintenance and improvement of statistics, and analysis of trends, terms, and problems	Washington, D.C.	Yes	4-C
FE 1-3	Operations of financial institutions that extend short- and intermediate-term credit to farmers	Washington, D.C., East Lansing, Mich., & Madison, Wis.	Yes	4-C
FE 1-4	Savings and investments of farm operators	Washington, D.C. & East Lansing, Mich.	Yes	4-C
FE 1-5	Balance sheet of agriculture and agricultural finance outlook	Washington, D.C., Madison, Wis., Ames, Iowa, & Urbana, Ill.	Yes	4-A
FE 1-6	Relationship of supply and demand for long-term farm credit to adjustments in agriculture	LaFayette, Ind.	No	—
FE 1-7	Cost, terms, and availability of credit for rural housing	Washington, D.C., Columbia, Mo., & Bozeman, Mont.	Yes	4-B
FE 1-8	Financing modern large-scale farming in Michigan	East Lansing, Mich.	Yes	4-C
FE 1-9	Effective use of capital and credit in agricultural adjustment in Wisconsin	Madison, Wis.	Yes	4-C
FE 2	Farmland values and valuation			
FE 2-1	Current developments in the farm real estate situation	Washington, D.C. & Madison, Wis.	Yes	7-A&B
FE 2-2	Annual estimates and analysis of trends in farm real estate rentals	Washington, D.C.	Yes	7-C
FE 3	Agricultural risks and insurance			
FE 3-1	Improvement of farmers' mutual fire, windstorm, and crop-hail insurance company operations	Washington, D.C.	Yes	5-A
FE 3-2	Organized farm fire protection and estimation of annual farm fire losses	Washington, D.C.	Yes	5-B
FE 3-3	Casualty and life insurance (including social security) and accident prevention for farmers	Washington, D.C.	Yes	5-C
FE 3-4	Analysis of risks and risk-bearing in agricultural production	Washington, D.C. & Bozeman, Mont.	Yes	5-D
FE 4	Agricultural taxation and government			
FE 4-1	Impact and economic effects of taxes on agriculture	Washington, D.C., Urbana, Ill., & Ithaca, N. Y.	Yes	6-A&B
FE 4-2	Organization and financing of local government in rural areas	Washington, D.C., St. Paul, Minn., & Ames, Iowa	Yes	6-C
FE 4-3	State-local fiscal structures and their relation to farm taxes	Washington, D.C. & Urbana, Ill.	Yes	6-A

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			Summary of Progress	Area & Subheading
FE 9	Agricultural adjustments and production response			
FE 9-1	Economic evaluation of forage production and utilization in New Hampshire	Durham, N. H.	Yes	2-A
FE 9-2	A study of farm organization and management problems in southeastern and southwestern Minnesota	St. Paul, Minn.	Yes	2-A
FE 9-3	Economic relationships between selected conservation practices and corn yields in western Iowa	Ames, Iowa	No	---
FE 9-4	An economic evaluation of changes in use of farm lands within Wisconsin watershed projects	Madison, Wis.	No	---
FE 9-5	Economics of adjustments in beef production in the west	University Park, N. Mex., Ft. Collins, Colo., Lincoln, Nebr.	Yes	1-G
FE 9-6	Adjustments in irrigated crop production in the Upper Texas Panhandle **	College Station, Tex.	Yes	2-B
FE 9-7	Economics of adjustments in cotton producing areas in California	Davis, Calif.	Yes	1-D
FE 9-8	Adjustments in the economy of the Belle Fourche area and analysis of Newell Field Station experiments	Newell, S. Dak.	Yes	1-G
FE 9-9	An economic appraisal of adjustments opportunities in Southern rice producing areas	Fayetteville, Ark., Baton Rouge, La., & College Station, Tex.	Yes	1-F
FE 9-10	Effects of alternative levels of grazing fees and privileges on ranch organization and net returns in public land areas	Washington, D.C. & selected States	Yes	1-G
FE 9-11	Adjustments in hog and beef cattle production in the Corn Belt to meet changing conditions--FE cooperation in Regional Project NC-54	Washington, D.C. & selected States	Yes	1-G
FE 9-12	Economic appraisal of soil, water and crop practices on farm and ranch lands in the 17 western States	Ft. Collins, Colo.	Yes	2-B
FE 9-13	An economic appraisal of boll weevil damage and alternative methods of control	Washington, D.C. & selected States	Yes	2-A
FE 9-14	Economic appraisal of adjustments in Corn Belt farming to meet changing conditions	Washington, D.C. & selected States	Yes	1-G
FE 9-15	Economic appraisal of adjustments in dairy farming in the Lake States and adjoining areas to meet changing conditions	Washington, D.C. & selected States	Yes	1-C
FE 9-16	Economic appraisal of adjustments in dairy farming in the Northeast to meet changing conditions	Washington, D.C. & selected States	Yes	1-C
FE 9-17	Economics of adjustments on farms and production response in the Northern Plains wheat producing region	Washington, D.C. & selected States	Yes	1-E
FE 9-18	Production economics studies of agricultural production control programs	Washington, D.C. & selected States	Yes	1-H
FE 9-19	Analysis of agricultural production response	Washington, D.C. & selected States	Yes	1-B
FE 9-20	Economic appraisals of emerging technological developments in Southern agriculture	Washington, D.C. & selected States	Yes	2-A
FE 9-21	An economic appraisal of emerging crop, livestock, and poultry technologies in the Northern Region	Washington, D.C. & selected States	Yes	2-A
FE 9-22	An economic appraisal of farming adjustment opportunities in the Southeastern region to meet changing conditions	Washington, D.C. & selected States	Yes	1-D
FE 9-23	Economics of adjustments on farms and production response in the Southern Plains wheat producing region	Washington, D.C. & selected States	Yes	1-E
FE 9-24	Economics of adjustments on farms and production response in the Pacific Northwest wheat producing region	Washington, D.C. & selected States	Yes	1-E
FE 9-25	Farm management under conditions of variable output in the Great Plains	Bozeman, Mont.	Yes	2-A

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			Summary of Progress	Area & Subheading
FE 9-26	An economic appraisal of business survival probabilities of farms and ranches in the Great Plains Area of Oklahoma	Stillwater, Okla.	Yes	2-A
FE 9-27	An economic appraisal of farming adjustment opportunities in the South Central region to meet changing conditions	Washington, D.C. & selected States	Yes	1-D
FE 9-28	Economic appraisal of regional adjustments in agricultural production and resource use to meet changing demand and technology	Washington, D.C. & selected States	Yes	1-B
FE 9-29	Long term projections for the production of agricultural commodities in the Pacific Northwest* (pending)	Corvallis, Oreg.	Yes	1-A
FE 9-30	Economic analysis of production problems and adjustments on western range-livestock ranches* (pending)	Washington, D.C. & selected States	Yes	1-G
FE el-7 (Rev.)	Economics of beef production farming systems in the Mississippi Delta**	Stoneville, Miss.	Yes	1-G
FE el-23	Drought and drought recovery practices on ranches in the Southern Great Plains**	University Park, N. Mex.	No	---
FE el-25	Adjustments in ranch management associated with range and pasture improvement practices in California**	Davis, Calif.	Yes	2-A
FE el-28	Cattle production and range management in western South Dakota**	Brookings, S. Dak.	No	---
FE el-30	Livestock and range management in the Plains of Wyoming**	Laramie, Wyo.	No	---
FE el-31	Adjustments to range improvement practices in New Mexico**	University Park, N. Mex.	Yes	2-B
FE e3-44	Adjustments in dairy and feed production in California**	Berkeley, Calif.	No	---
FE 5-4	Economic evaluation of agricultural land drainage and related management of farms in Michigan	East Lansing, Mich.	Yes	2-B
FE 6-3	Economic appraisal of use of water for irrigation on Missouri farms**	Columbia, Mo.	Yes	2-B
FE 6-12	Adjustments to limited irrigation water in Upper Colorado River Basin**	Logan, Utah	No	---
FE 10	Economics of farm size			
FE 10-1 (Rev.)	Economic appraisal of minimum farm resources needed for specified farm income levels	Washington, D.C. & selected States	Yes	3-B
FE 10-2	Classification and analysis of kinds and sizes of farms	Washington, D.C.	Yes	3-B
FE 10-3	Effects of changes in size of farm in farm output and efficiency	Washington, D.C.	Yes	3-B
FE P-1	Pioneering research in vertical coordination	Washington, D.C.	Yes	3-A
FE 11	Economics of farm labor resources and utilization			
FE 11-1	Maintenance and improvement of annual estimates of labor requirements in American agriculture	Washington, D.C.	Yes	10-A
FE 11-2	Measurement and analysis of labor productivity and efficiency in American agriculture	Washington, D.C.	Yes	10-B
FE 11-3	Labor and capital in selected crops and areas in California	Davis, Calif.	Yes	10-C
FE 11-4	An economic study of alternative income opportunities for low-income rural families in the Ozarks of Arkansas**	Washington, D.C. & Fayetteville, Ark.	No	---
FE 11-5	Economic and related aspects of providing housing for migrant hired farmworkers	Washington, D.C. & Corvallis, Oreg.	Yes	10-D

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			Summary of Progress	Area & Subheading
FE 12	Economics of technological changes in farming			
FE 12-1	Measurement and analysis of progress in farm mechanization	Washington, D.C.	Yes	8-A
FE 12-2	National survey and analysis of selected farm production practices	Washington, D.C.	Yes	8-E
FE 12-3	Maintenance and improvement of annual estimates of feed consumption and animal units in the U. S.	Washington, D.C.	Yes	8-D
FE 12-6	Economic interpretation of yield response to fertilizer and associated technology	Washington, D.C.	Yes	8-C
FE 12-7	The farm demand for fertilizer, machinery, and structures	Washington, D.C. Ames, Iowa, and East Lansing, Mich.	Yes	8-A 8-B 8-C
FE 12-8	Estimates of principal plant nutrients used on specified crops**	Washington, D.C.	Yes	8-E
FE 12-9	Economic evaluation of pasture production*	Washington, D.C.	Yes	8-D
FE c1-15	Cost and performance of selected farm machines in Nebraska**	Washington, D.C. & Lincoln, Nebr.	Yes	2-A
FE 13	Farm output and resources productivity			
FE 13-1	Maintenance, improvement and analysis of overall measures of farm production	Washington, D.C.	Yes	1-A
FE 13-2	Measurement and analysis of changes in resources used, and efficiency of resource use, in agriculture	Washington, D.C.	Yes	1-A
FE 13-3	Appraisal of the influence of weather on crop yields and production*	Washington, D.C.	Yes	1-A
FE 13-4	Appraisal of farm production prospects and resource needs	Washington, D.C.	Yes	1-A
FE 14	Farm costs and returns			
FE 14-1	Annual estimates and analyses of changes in costs, returns, and farm organization on commercial family-operated farms by type and size	Washington, D.C.	Yes	9-A
FE 14-2	Preparation of "Farm Cost Situation" reports	Washington, D.C.	Yes	9-A
FE 14-3	Cost and returns on commercial poultry farms (egg and broiler) in the Northeastern, Middle Atlantic, and Southeastern States	Washington, D.C.	Yes	9-A

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